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مجلة علمية فصلية مُحكمة متخصصة

بعلوم الرياضة تصدر عن

كلية التربية البدنية وعلوم الرياضة

جامعة بغداد

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جامعة بغداد
كلية التربية البدنية وعلوم الرياضة

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كلية التربية البدنية وعلوم الرياضة في جامعة بغداد

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العدد الاول
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تصميم الغلاف: د. ياسر وجيه قدوري

تعليمات النشر في مجلة التربية الرياضية

أولاً: تعليمات عامة:

- مجلة علمية رياضية فصلية غير ربحية، متخصصة بنشر البحوث العلمية الخاصة بعلوم الرياضة، لأغراض النشر العلمي، تصدرها كلية التربية البدنية وعلوم الرياضة / جامعة بغداد.
- تعتمد المجلة سياسة التحكيم السري المزدوج والوصول الحر للبحوث دون قيد او شرط.
- يتم استخدام الأسماء وعناوين البريد الإلكتروني والهواتف في قاعدة بيانات المجلة للأغراض العلمية فقط الخاصة بالمجلة ولن تكون متاحة للجميع أو تستعمل لغرض آخر.
- تعتد مجلة التربية الرياضية الرخصة (CC BY 4.0) (a Creative Commons Attribution 4.0 International license) وهي بذلك تحفظ حقوق الملكية الفكرية للباحثين الناشرين فيها، وفي الوقت نفسه تتيح للاخرين بتحميل ومشاركة وإعادة اسخدام وتوزيع البحث في نطاق واسع. للمزيد من المعلومات، انقر على الرابط ادناه: https://creativecommons.org/licenses/by/4.0/
- تتم إجراءات المراجعة الأولية للبحث المرسل من قبل هيئة التحرير واجراء الاستلال الإلكتروني، ويتم اعلام الباحث بأي مشكلة خلال الأسبوع الاول من استلام البحث.
- يتم إحالة البحث للتحكيم العلمي من قبل هيئة التحرير لمحكمين أثنين معتمدين من قبل المجلة وبشكل سري.
- تتم عملية التحكيم خلال مدة (3) اسابيع وفق تعليمات المجلة (ارشادات المحكمين).
- بالاعتماد على توصية المحكمين، يتم قبول البحث كما هو او قبولة بعد اجراء التعديلات او رفضه، ويتم اعلام الباحث بذلك.
- بعد الانتهاء من التحكيم، يتم طلب دفع رسوم النشر البالغة (120000) الف دينار عراقي. علماً إن المجلة غير ربحية والنفقات أعلاه لتغطية أجور التحكيم والنشر والترجمة فقط.
- يكون النشر للباحثين من خارج العراق مجاني وبشكل كامل ولحد نهاية سنة (2026).
- كل إجراءات تحكيم البحوث تكون الكترونياً اعتماداً على نظام المجلات المفتوحة (OJS).

ثانياً: شروط كتابة البحث:

تتبع مجلة التربية الرياضية (JOPE) طريقة (IMRAD) في كتابة البحوث وهي ترمز الى الحروف الأولى لكلمات: المقدمة (Introduction). الطريقة والأدوات (Materials and Methods). النتائج (Results) و (And). المناقشة (Discussion).

ورقة واجهة البحث: ويجب أن تتضمن الاتي:

- **عنوان البحث (Research Title):** يعد عنوان البحث الجزء المميز منه الذي يقرأه عدد كبير من الباحثين ويحتوي العنوان ايضا اسم الباحث (الباحثين) وعناوينهم (طرائق التواصل معهم).
- **شروط عنوان البحث:**
  - ✓ يحوي على عدد قليل من الكلمات كلما امكن ذلك، و بما لا يزيد عن (12) كلمة.
  - ✓ يكون واضح وسهل الفهم ولا يحتوي على المختصرات.
  - ✓ يشرح محتويات البحث بدقة وبشكل محدد.
  - ✓ ان لا يكون بصيغة استفهامية كما في المقالات الصحفية.
  - ✓ يشير الى موضوع البحث وليس النتائج.
- **اسم المؤلف (المؤلفون)(Authors):** مؤلف البحث هو الشخص او الأشخاص الذين أسهموا بشكل فعلي في تخطيط وتنفيذ البحث. ويتم تثبيت أسماء المؤلفين بتسلسل منطقي نسبة الى أهمية مشاركتهم في البحث، اذ يُعد الاسم الأول بالبحث هو كبير معدي البحث وبكلام اخر المؤلف الأول (Senior Author) في حين يتم ترتيب باقي المؤلفين نسبة الى أهمية وقدر مشاركتهم في إتمام البحث. يكون طالب الدراسات العليا المؤلف الاول في اطروحته او رسالته يليه المشرف الرئيس بوصفه المؤلف الثاني وهكذا، علماً ان المجلة تعتمد تسلسل الباحثين حسب ما هو مثبت في البحث المرسل للمجلة. يجب ادراج هامش يشير الى المعلومات الخاصة عن المؤلفين كافة للاتصال بهم بهدف التعاون او الاستيضاح او اي شأن يخص البحث ومجال الاختصاص، ويجب ملاحظة ان يكتب الاسم الثلاثي واللقب للمؤلفين مع ذكر عنوان العمل و وسيله الاتصال (البريد الالكتروني– رقم الهاتف) وباللغتين العربية والانكليزية.
- **مستخلص البحث (Abstract):** ينقل الملخص معلومات البحث القائم فعلا مع مراعاة عدم استعمال عبارات الوعود (سوف يقدم، سوف يعرض.... وغيرها)، ويكون ملخص البحث بمعدل (150–250) كلمة ويكتب في فقرة واحدة باللغتين الإنكليزية والعربية. يبدأ الملخص بترتيب متسلسل بعرض الاهداف ثم توضيح الإجراءات المستعملة واهم النتائج المتضمنة حقائق جديدة

تتعلق بتحقيق الأهداف، وأخيرا الاستنتاجات الرئيسة ومستوى دلالتها (Sig). وتكتب افعال جمل عرض الأهداف والمقدمة ومناقشة النتائج والاستنتاجات في الزمن المضارع، في حين تكتب الإجراءات والاختبارات والنتائج في الزمن الماضي. يجب ان لا يحتوي ملخص البحث على الاتي:

- ✓ الاختصارات (الاحرف المختصرة) الا اذا كانت معيارية او معروفة مسبقا مثل (Vo2Max).
- ✓ الإشارة الى الجداول او الاشكال في متن البحث والاستشهاد بالمصادر.
- ✓ أي معلومات او استنتاج غير موجود في متن البحث والجمل العامة والجمل المطولة او المعقدة او الملتوية (المراوغة).
- ✓ تجنب ذكر البيانات الكمية بشكل مفصل وكذلك المعالجات الاحصائية والمصطلحات الطويلة جدا.
- ✓ ذكر المتوسط الحسابي والانحراف المعياري لأعمار وأوزان وأطوال عينة البحث. مثال: (متوسط الطول) متر (± الانحراف المعياري).

- **الكلمات المفتاحية (Key Words):** يجب ان يتضمن البحث كلمات مفتاحية بعدد لا يتجاوز (6) كلمات، ويجب ان تكون محددة بالدراسة وغير الكلمات الموجودة في عنوان البحث، وعلى ان تكتب في نهاية ملخص البحث بفقرة منفصلة وباللغتين الإنكليزية والعربية.
- **المقدمة (Introduction):** تكون مقدمة البحث الجيدة قصيرة نسبياً، تشرح أهمية الدراسة وتحديد اهدافها من خلال البحث في الادبيات ذات العلاقة من مراجع ودراسات، ويكون ذلك عن طريق استعراض مختصر لهذه الدراسات والتي تكون ذات علاقة بمشكلة البحث والتي يجب ان لا تقل عن خمسة دراسات حديثة ومناسبة لتعزيز البحث، كما ان المقدمة تُعَرِف بالمصطلحات الخاصة او المختصرات التي سيتضمنها متن البحث لاحقاً، ويفضل أن لا تتجاوز عدد الكلمات في مقدمة البحث عن (500) كلمة وأن لا تتضمن تكرار لعبارات او مفاهيم ذكرت في اي موقع من الملخص، مع مراعاة تجنب العبارات الانشائية والجمل التي لا تضيف للقارئ معلومة مثل إعادة الحقائق والحالات البديهية.
- **الطريقة والادوات (Materials and Methods):** ان الغرض من هذا القسم هو لعرض ما تم عمله، وكيف تم، وأين تم، وذلك بطريقة مباشرة وبسيطة فضلاً عن التعريف بكيفية جمع البيانات وعرضها وتحليلها. اذ يجب ان يوفر هذا القسم من البحث كل المعلومات الضرورية اللازمة للسماح للمؤلفين الآخرين للحكم على الدراسة والإفادة منها، ويجب مراعاة ترتيب

الاجراءات الميدانية زمنياً مع توفير كافة المعلومات الضـــرورية فقط، وعلى وفق ذلك يتطلب ان يتضمن هذا القسم من البحث على الآتي مع أهمية تسلل الفقرات:

- ✓ منهج البحث وتصميمه المستعمل.
- ✓ الوصف الدقيق لعينة البحث من حيث (الجنس والعمر والوزن.... وغيرها).
- ✓ تصـــميم التجربة مع عدد مرات اجراء الاختبار او القياس وإيجاز الإجراءات المســـتعملة لأخذ العينات (إجراءات الاختبارات).
- ✓ ذكر الأجهزة والادوات المستعملة مع مواصفاتها الفنية الدقيقة وعددها ومصدرها وطريقة العمل بها (الضرورية منها فقط غير شائعة الاستعمال). ويجب استعمال الأسماء العلمية للأجهزة بدلاً عن اسمائها التجارية مع ذكر أسماء الشركات المصنعة للجهاز واية معلومات تفيد القارئ.
- ✓ وصف التعديلات اذا ما تم اجراءها على القياسات الروتينية (الاختبارات)، اما إذا ما تم استعمال اجراء جديد (اختبار جديد) فيجب ذكره وشرحه بالتفصيل.
- ✓ توضـــيح طريقة اجراءات البحث من تجربة واختبارات ورقية، وعملية، وشـــفوية او على جهاز الحاسوب.
- ✓ الطريقة الإحصائية (او/و) الرياضية المستعملة لتحليل وتلخيص البيانات.
- ✓ يحق للمجلة ان تطلب من المؤلفين تفاصيل او معلومات إضافية عن أي جزء من أجزاء البحث.

وبشـــكل عام يجب ان يضـــع المؤلفين بعين الاعتبار الأمور الآتية عند كتابته لإجراءات البحث:

- ✓ لا يجوز استعمال المختصرات) بأي لغة كانت) قبل تعريفها في ملخص البحث او مقدمته.
- ✓ تحديد نظام وحدات القياس الدولية المستخدم في البحث، مثل (المتر، كيلوغرام، الثانية ... الخ)
- ✓ توضـيح جميع المواد المسـتعملة في الدراسـة بحيث يمكن للقارئ اسـتعمالها في بحوث مشـابهة أخرى.
- ✓ وصـف اهداف واجراءات القياس لكل اختبار (اختبار قبلي – اختبار بعدي– اختبار احتفاظ ... وهكذا).
- ✓ وصـف كل التقنيات والاختبارات المسـتعملة بذكر اسـمها فقط إذا كانت معروفة وقياسـية او ذكر التفاصيل في حالة كونها جديدة او تم اجراء تعديل عليها.
- ✓ لا يجوز اضافة معلومات لا تمت بصلة بالنتائج، والتي يمكن ان تربك القارئ.
- ✓ استخدام الافعال بصيغة الماضي في عرض اجراءات البحث.

- **النتائج (Results):** يُقدم هذا القسم من البحث المعلومات الجديدة التي توصل لها الباحث، لذا يعد على انه أساس (مركز) البحث. ويلاحظ ان مقدمة البحث والإجراءات صُممت للإجابة عن التساؤلات؛ لماذا وكيف وصل الباحث (الباحثين) لهذه النتائج والتي سيتم تفسيرها في قسم المناقشة، لذا فان قيمة البحث تكون بما يتضمنه من نتائج، ويجب ان يتم عرضها بطريقة واضحة جداً ومباشرة وباستعمال العدد الضروري من الكلمات دون اسهاب او اختصار، وعادة ما يكون عرض النتائج أسهل فهماً إذا ما تم ترتيب العرض على وفق تسلسل اهداف البحث التي تم ذكرها في مقدمة البحث.

إرشادات حول عرض نتائج البحث:

- ✓ أعرض نتائج البحث بشكل بسيط وواضح في جداول او اشكال وذلك لتسهيل فهمها ومقارنتها. ملاحظة ان الجداول تعرض أرقاما دقيقة في حين ان الاشكال تظهر الاتجاهات ذات الخصائص ولا يجوز عرض ارقام الجداول نفسها في الاشكال.
- ✓ لا يجوز اعادة النتائج كتابةً بعد عرضها في الجداول أو الاشكال التوضيحية، ويمكن فقط الإشارة الى اهم ما مؤشر في الجداول او الاشكال (أي عدم استعمال العرض الكتابي للجداول).
- ✓ وثق واعرض فقط البيانات الضرورية بدلاً من الاسهاب والتكرار في عرض البيانات ولا تعرض بيانات كثيرة واختصرها بالتحليل الاحصائي ولخصها لعرضها في جداول او اشكال وذلك لتسهيل فهمها ومقارنتها.
- ✓ ضمن نتائج البحث بالنتائج السلبية (ما لم يتحقق) إن كان ذلك مفيدا لتفسير النتائج.
- ✓ عند كتابة النتائج يتم الاشارة الى الجداول أو الاشكال بأرقامها (الجدول1) (الشكل1).

المناقشة Discussion: في هذا القسم من البحث يفسر الباحث (الباحثون) مضمون النتائج ودلالاتها والاثار المترتبة عليها. وتُبين المناقشة أهمية وقيمة العمل المنجز كما انها تربط كل أجزاء البحث معا. ان مهارة الباحث (الباحثين) في تفسير النتائج الجديدة، على وفق الحقائق المعروفة باستخدام نتائج البحث هي دليل على التغيرات المبتكرة (الابداعية) للسلوك الملاحظ، ويجب ان تدفع حدود معرفة القارئ (توسع مداركه) وتثير حماسته. وعلى الباحث ان يلتزم بالآتي في مناقشته للنتائج:

- ✓ ناقش على ضوء معنوية النتائج.
- ✓ لا تكرر ما تم ذكره في الدراسات السابقة.

- ✓ تتضمن مناقشة النتائج تفسير اتفاقها او عدمه مع المعلومة او المعرفة في الدراسات المنشورة سابقاً.
- ✓ تدعيم النتائج التي توصلت اليها بأساس نظري علمي (ما هي الأسباب العلمية للنتائج المتحققة).
- ✓ اقترح بحوث مستقبلية مخطط لها او بحوث بحاجة الى متابعة (دراسة).
- ✓ لا يجوز اضافة معلومات لم يتناولها البحث، وان يتم التعامل مع النتائج الموثقة في الدراسة الحالية فقط.
- ✓ تجنب التعميم والتخمين للنتائج والتي لم تؤكدها الدراسة.
- ✓ تكتب المناقشة بصيغة المضارع والماضي، اذ تكتب المعارف المتوافرة من الادبيات والأبحاث بصيغة المضارع، في حين تكتب مناقشة نتائج البحث الحالي بصيغة الماضي.

الاستنتاجات (Conclusions): الاستنتاجات ليست إعادة صياغة لنتائج البحث، انما هي مستنبطة منها. فالاستنتاجات تشير الى الخطوط العريضة للدراسات المستقبلية استناداً على نتائج الدراسة الحالية. ويمكن تخصص فقرة مستقلة للاستنتاجات.

الشكر والتقدير (Acknowledgments): تسمح المجلة بتضمين كلمات الشكر والتقدير في نهاية البحث ويخصص لشكر المؤسسات والافراد الذين قاموا بمساعدة حقيقية للباحث لأجراء بحثه اذ يُقدم الشكر للشركة، او المؤسسة التي قدمت الأموال لدعم البحث، او المختبرات التي زودت الباحث بالأدوات والأجهزة، او الى الأشخاص الذين قدموا للباحث النصيحة والمساعدة في جميع البيانات، او التحليل او أي أمر اخر مهم. كما ان هذا القسم يعد مكاناً لذكر أصل البحث وبكلام اخر اذ كان البحث مستلاً من رسالة ماجستير او أطروحة دكتوراه.

المصادر (References): تتضمن قائمة المصادر كل الاستشهادات المعتمدة في متن البحث فقط وبطرقة (APA) الإصدار السادس حصراً وفق نظام (Microsoft Word 2010) صعوداً أو برنامج (Mendeley) أو (EndNote). ان الاستشهادات النصية في متن البحث يجب ان تتطابق تماما مع قائمة المصادر.

الملاحق (Appendix): يمكن ادراج أي معلومات تخص البحث المهمة منها حصراً ضمن الملاحق، إذ تحتوي الملاحق على تفاصيل المنهاج التدريبي او البيانات او الجداول الكبيرة (الجداول المعيارية) أو أدوات البحث مثل الاستبيانات وبرامج الحاسوب المستعملة او الأجهزة المصنعة والتي يجب عرضها وشرحها لأهميتها والتي لا يمكن ادراجها ضمن متن البحث بسبب كبر حجمها.

جدول توضيحي يلخص طريقة امراد (IMRAD)

ت	القسم	الغرض او الهدف
1	العنوان	عن ماذا البحث.
2	المؤلفون (الباحثون)	أسماء وانتماءات المؤلفين.
3	الكلمات المفتاحية	الكلمات غير الموجودة في العنوان والتي توصف البحث.
4	الملخص	شرح قصير عن ذلك البحث.
5	المقدمة	لماذا هذا البحث؟ والمشكلة وماهو غير المعلوم واهداف البحث؟
6	الأدوات والإجراءات	كيف تم اجراء البحث؟
7	النتائج	ماذا وجدت؟
8	المناقشة	ماذا يعني ذلك؟ وما التالي؟ وتفسير النتائج والتوجه المستقبلي.
9	الاستنتاجات	الاثار المحتمليه (الممكنة)
10	الشكر والتقدير	لمن ساعدوك وكيف؟ وماهو مصدر التمويل؟
11	المصادر	تفاصيل عن استشهادات البحث.
12	الملاحق	المواد التكميلة.

ثالثاً: شروط استلام البحث لغرض النشر في مجلة التربية الرياضية:

- ✓ أنّ لا تزيد عدد كلمات البحث عن (2500–3000) كلمة.
- ✓ أنّ يطبع البحث بنظام (Microsoft Word 2010) صعوداً بحجم خط (12) لمتن البحث و (14) غامق للعناوين الرئيسة وبنوع (Simplified Arabic) للغة العربية و (Times New Roman) للغة الإنكليزية بأبعاد الصفحة القياسية (عمودي – 2.54×3.17 سم). وبمسافة منفردة بين الاسطر و (1) بين الفقرات.
- ✓ أنّ يثبت اسم الباحثين الكامل والصحيح باللغتين العربية والإنكليزي أسفل عنوان البحث، في حين تثبت معلوماتهم (الشهادة، والقابهم العلمية ومكان عملهم ووسيلة الاتصال بهم البريد الاليكتروني ورقم الهاتف مع المفتاح الدولي) في هامش الصفحة الاولى.
- ✓ ترقم صفحات البحث الكترونياً أسفل ووسط الصفحة.
- ✓ تكون أبعاد الصور او الاشكال متناسقة وباستعمال الماسح الضوئي حصراً وبدقة عالية.

- ✓ يكتب رقم الجدول وعنوانه بشكل مختصر ووافي اعلى الجدول في حين يكتب رقم وعنوان الصورة او الشكل في الأسفل وبشكل ومختصر ووافي.
- ✓ ينشـر البحث باللغة الإنكليزية بعد ان يتم ترجمته من قبل المجلة يمكن ارسـال البحوث او يمكن ارساله باللغة الإنكليزية.
- ✓ تطبع الأرقام بالصيغة العربية حصراً (0 1 2 3 4)، وعند استعمال الاقواس لا يتم ترك مسافة بين الاقواس مثل: (2540)، وعدم ترك مسافة قبل علامات الترقيم مثل الفارزة، او النقطتين، او النقطة. مثال: التدريب الرياضي، التعلم الحركي، علم النفس الرياضي.
- ✓ لا يجوز اسـتعمال برامج الترجمة الفورية او مواقع الانترنت للترجمة للغة الانكليزية مثل (google translate) وغيرها.
- ✓ استعمال المصطلحات العلمية المعروفة والمتداولة، وعلى الباحثين المقدمين لبحثهم باللغة العربية ادراج المصطلحات العلمية باللغة الإنكليزية في متن البحث.
- ✓ الاستشهاد بالمصادر يكون وفق أسلوب (APA) الإصدار السادس حصراً وفق نظام (Microsoft Word 2010) صعوداً أو برنامج (Mendeley) أو (EndNote).
- ✓ يجب ان تتطابق الاستشهادات النصية في متن البحث تماماً مع قائمة المصادر.
- ✓ لا يقبل الاستشهاد من المواقع الاليكترونية العامة والضعيفة.
- ✓ يقبل الاستشهاد من المواقع العلمية الرصينة الرصينة بالاعتماد على البحوث المنشورة المجلات المُحكمة والكتب العلمية والرسائل والاطاريح الجامعية المحلية او الدولية.
- ✓ يجب أنّ لا تقل الاستشهادات بالمصادر العلمية عن (25) مصدر رصين وبواقع (50%) من البحوث العلمية كحد أدنى، و (50%) كحد أعلى من الكتب العلمية.
- ✓ يجب ان تكون المصادر حديثة (اخر خمس سنوات)، مع وجود بعض الاستثناءات الضرورية.

ثبت المحتويات

ت	اسم المؤلف (المؤلفين)	عنوان البحث	الصفحة
1	Abbas Hussein Khalifa	The effect of exercises using an innovative electronic device on learning to perform the skill shooting from constancy in basketball for students at the College of physical education and sports sciences	1501-1488
2	Ali Fouad Majeed ،Yassar Sabeeh Ali ،Muhanned Yaseen Abdulghani ،Moneer Fadel Ali Hassan ،Omar Waleed Abdulkareem ،Alaa Abdullah Falah	Analytical Study of Touch Areas and Preparatory Movements Leading to The Touch in Epee Fencing in The Men's Team Final at The Paris 2024 Paralympics	1502-1513
3	Amani Jawad Ibrahim ،Liqaa Abdullah Ali	The Effect of Combined (Physical - Skill) Exercises Using a Designed Device on Developing Some Shooting Skills for Basketball Players Under 18	1514-1528
4	Diyar Muhammed Ali	The effect of water intake on body composition, weight, BMI, body fat and total body water in obese men	1529-1538
5	Haider Radhi Rahim Dhabyaa Jafer Hawash Aghader Hadi Jasim	The effect of an educational approach based on Schmidt's Schema Theory on learning some basic tennis skills	1539-1550
6	Harith Mebsher Mohammed	The Effect of Contrast Training on the Development of Muscular Power and Selected Physiological Indicators in Advanced Basketball Players	1551-1564
7	Ahmed Thare Hani	The Impact of a Psychological Guidance Program on Reducing Role Conflict Among First-Degree Referees Participating in The Iraqi Stars League in Football	1565-1581

1582-1597	The Effect of Tactical Exercises Based on Maximal Aerobic Capacity on Developing Some Physical Abilities and Fast Offensive Transition in Youth Basketball Players	Doaa Habeeb Talab	8
1598-1612	Educational Leadership as a Tool for Social Cohesion: Strategic Management Methods of Schools in Promoting a Culture of Peace and Citizenship in Lebanese Society	Huossein Mohammad Saad	9
1613-1622	The effect of strength training on blood levels of (lysine and valine) in tennis players	Hussein Ali Hussein	10
1623-1639	analytical study of the competitive excellence of the sports clubs of the Iraqi Ministry of Interior from the perspective of the employees	Munir Abdul-Kadhim Al-Kaabi ،Farqad Abduljabbar Kadhim	11
1640-1653	The relationship between decision-making time and accuracy of jump shooting among students at the college of physical education and Sports Sciences in handball	Mustafa Ahmed Obaid	12
1654-1670	The Effect of Plyo-agility Exercises on Improving agility and Developing Defensive Tracking ability in Basketball players Under 18 Years of Age	Omar Mohammed Majed	13
1671-1681	The effect of an educational approach according to the Schmuck model in testing cognitive information processing and learning some basic football skills for students	Razaq Saeed ،Saleh Amish ، Ayad Salman	14
1682-1699	The Effect of Using the Pentagram Strategy as a Modern Tool for Teaching the Chest Pass and Layup Skills in Basketball for Juniors Under 14 Years Old	Abeer Abbas Harz ،Laith Mohammed Abdulrazzaq	15

1700-1715	The reality of practicing artificial intelligence for employees of Omani sports federations in accordance with Oman Vision 2040	Kamla bint Abdullah bin Saif Al Wahibiya ،Ali bin Salam bin Ali Al Yarubi ،Ezzedine Muhammad Ezzedine Muhammad	16
1716-1731	The impact of game simulation drills on blocking and various defensive movements for handball players (15–18 years old)	Muntadhar Mahmoud Rzouqi ، Ali Hatem Al-Wali	17
1732-1748	The effect of preventive exercises using different weights on improving some health fitness variables for first-year female students at the College of Physical Education and Sports Sciences for Girls	Noor Al-Huda Adnan Fadhil ، Lamyaa Abdul Sattar	18
1749-1766	The Role of Polar Device in Improving Sports Training a Field Study: Joya Sports Club in Southern Lebanon	Rida Trad	19
1767-1777	Motor coordination and its relationship to high shooting accuracy in handball for second-year students at the College of Physical Education and Sports Sciences	Ruqia Abdulredha Muhsin Maath Abdulkareem Fadhil	20
1778-1797	The organizational climate and its relationship to total quality management among secondary school principals in Baghdad province from the perspective of their teachers	Zubaidah Abdulwahab Al-Dabbagh ،Thaer Dawood Salman	21
1798-1812	Administrative Transparency of Middle and Preparatory School Principals in the Karbala Governorate Education Directorate from the Perspective of Physical Education Teachers	Durgham Jaber Jassim ، Thamer Hammad Reja	22
1813-1826	The Effect of Active Learning on Improving the Performance of Some Floor Movement	Basma Tawfiq Saleh	23

	Skills in Gymnastics for Fifth-Grade Female Students		
1827-1834	The Relationship Between Some Kinematical Variables and Accuracy of the Spike in Volleyball for Ages (14–16)	Mohammed Adel Yousif ،Alaa Muhsen Yasser	24
1835-1848	An analytical study of neuromuscular coupling at maximum load for weightlifters utilizing high-density electromyography of the surface for the snatch lift	Omar Khalid Yasir	25
1849-1860	An Analytical Historical Study of the Most Important Iraqi Paralympic Table Tennis Results Achieved Globally for the Period (2023-2025)	Mohammed Ismail Ibrahim	26
1861-1874	The Effect of the Hot Chair Strategy on Developing Cognitive Achievement in the Law of Volleyball among Female Students	Maher Amer Jabar	27
1875-1894	The Effect of Repeated Speed Exercises on Anaerobic Functional Variables, Explosive Leg Power, and Individual Defensive Movement in Handball	Sabreen Salah Aldeen ،Wedad Kadhim Majid	28
1895-1907	The Effect of Rehabilitation Exercises Accompanied by A Point-Laser Device on Restoring the Functional Abilities of The Injured Shoulder Joint in Advanced Athletes Participating in Sports Activities	Israa Jameel Hussein	29
1908-1916	Comparative Study of the Time Variable Between Grab Start and Track Start Types in Freestyle Swimming for Elite Swimmers	Waleed Qusay Abdul Latif	30

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The effect of exercises using an innovative electronic device on learning to perform the skill shooting from constancy in basketball for students at the College of physical education and sports sciences

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Abstract

Basketball is one of the sports that requires high mastery of motor skills the use of electronic devices can stand for a qualitative leap in the methods of teaching its basic skills. Therefore, the importance of the research was to study the effect of exercises using an electronic device designed specifically to teach the performance of the skill of shooting from constancy. The research focuses on exploring the effectiveness of these devices in improving skill acquisition and increasing performance accuracy among physical education and sports science students in line with modern developments in educational curricula. The two researchers used the experimental approach in the study as it is the optimal option The research community included the students of the first stage of the evening study at the College of physical education and sports sciences at the Mustansiriyah University for the academic year (2024-2025) numbering (46) students with a percentage of (48.93) % from the community of origin who belong to two classes (A B). The results showed that both the control and experimental groups had significant improvements in arithmetic mean between pre-test and post-test. The control group teams averaged 1.2 while the experimental group teams averaged 2.6. The T-values of both groups were higher than the calculated t-values which indicates statistical significance. The study concluded that an innovative electronic device improved basketball shooting skills by 2.6 points in the experimental group compared to 1.2 points in the control group. Real-time feedback has accelerated the learning process which supported the use of technology in sports training especially in complex motor skills.

Keywords: basketball, shooting, biomechanics, electronic device, motor learning.

Introduction

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Basketball constitutes one of the most widespread and respected team sports globally attributed to its inherent dynamism and constant movement that coordinates individual dexterity with collaborative teamwork. This sports discipline is based on several competencies with a special emphasis on shooting passing and dribbling as these competencies support the technical and collective effectiveness of the team. Mastery of shooting in particular through the skill of shooting from Fortitude is one of the basic skills that was prioritized during the early stages of basketball pedagogy due to its great influence on the accumulation of points that ultimately dictate the outcome of a win or loss. Shehata (2018) emphasizes that the execution of shooting from a stationary position needs a high degree of accuracy in performance and it needs a balance between strength and trajectory in order to successfully hit a target which makes it a fundamental competence in the progress of novice and experienced athletes. In the context of motor learning the process is characterized as a continuous course of constructive changes in performance resulting from repetitive practice and assimilation of feedback. Schmidt and Lee (2011) proved that motor learning entails a coherent interaction of physical and cognitive dimensions since the process involves not only strengthening physical maneuvers but also needs a deep understanding of performance parameters and error correction. In the same vein. One of the fundamental pillars for studying and improving motor abilities in a variety of sports including basketball is biomechanics. When applying mathematical skills motion analysis helps to understand how mechanical forces affect the body. One of the key elements in the shooting ability of steadiness is the control of elbow and wrist angles which determine the accuracy of the shot (Fadel et al. 2022). Since the angle of the elbow when performing directly affects the kinetic path that the ball takes the appropriate angle helps to provide the best force to achieve the injury. The wrist also plays an important role in knowing the direction and speed of the ball when it is released as the movement of the wrist helps to add rotation to the ball which increases the likelihood of its accuracy in the ring (Jassim 2024). The skill of shooting from immobility is one of the skills that requires high concentration by learners as it requires complete control of body movement while balancing speed and accuracy (Khalid Jassim 2024). Rank (2010) points out that teaching this skill requires following diverse learning strategies based on repetition and practical revision to gradually improve performance. Recent studies also confirm that improving the learning of shooting from consistency contributes to enhancing the confidence of players in their technical abilities which positively reflects on the performance of their team during matches. With technological progress electronic devices have emerged as an innovative educational method that helps to improve learning efficiency and develop motor performance. These devices contribute to an interactive learning environment that provides instant feedback allowing the learner to correct errors quickly and accurately (Ahmed Obaid et al. 2024). In a study conducted by Djerou (2019) it was found that the use of electronic devices in the teaching of mathematical skills promotes positive interaction between learners which enhances their ability to get skills. As part of the same framework Weinberg and Gould (2018) found that these devices help in improving concentration and enhancing effectiveness during training which makes them an important component of modern sport education. Since basketball is one of the sports that requires a high mastery of motor skills the use of electronic devices can stand for a qualitative leap in the methods of teaching its basic skills.

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https://jcope.uobaghdad.edu.iq

Therefore hence the importance of the current research to study the effect of exercises using an electronic device designed specifically to teach the performer the skill of shooting from immobility. The research focuses on exploring the effectiveness of these devices in improving skill acquisition and increasing performance accuracy in physical education and sports science students in line with recent developments in educational curricula.

Methodology

The experimental approach in this research involves the division of participants into two groups the first is the experimental group using the innovative electronic device and the second is the control group that continues training using traditional methods. This distribution allows the researcher to compare the performance between the two groups and determine whether the use of an electronic device has an effective effect on learning and improving the shooting skill of constancy.

According to Cohen et al. (2007) the experimental approach is best suited for research that requires measuring the impact of specific interventions on a certain group of motor skills. Mertens (2019) also noted that this approach allows a careful analysis of the results by controlling for variables that may affect the experiment enhancing the accuracy of the results that can be reached. Through the use of an innovative electronic device the research provides students with interactive training with instant feedback which helps to improve the technical performance of the shooting skill faster and more accurately compared to traditional training. The experimental approach demonstrates how these effects can be objectively evaluated which enhances the value and feasibility of research in the development of methods for teaching basketball skills in academic programs for physical education students.

Study design

The study is an experimental study using a Quasi-experimental design comparing two groups:

1-experimental group: uses an innovative electronic device to teach the skill of shooting from constancy.

2-the control group: practice using traditional methods without using the electronic device.

The study aims to measure the impact of using an electronic device on improving the accuracy of shooting compared to traditional methods and the data is collected through a pre-and post-test to measure the difference in performance between the two groups.

Participants

The research community included the students of the first academic year of evening study at the Faculty of Physical Education and sports sciences at Mustansiriya University for the academic year (2024-2025) Evening study numbering (94) students who belong to (3) classes (A B C) Class (C) was excluded from the research experiment for use in the exploration experiment. As shown in table 1.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Table1. ***Shows the number of research sample members and experimental totals***

classes	groups	The method used	Total No of students	No of excluded students	Remaining No of students
A	experimental group	electronic device to teach the skill of shooting from constancy	31	8	23
B	control group	traditional methods without using the electronic device	31	8	23
Total			62	16	46

The research sample was deliberately selected from the grades (A B) and the number of (46) students to apply the research experiment according to the following methods:

The first Group (A): uses the innovative electronic device to learn the skill of shooting from constancy with a basketball.

Group II (B): traditional methods are used to learn the skill of shooting from constancy with a basketball.

A number of students were excluded from the sample to achieve parity between the two groups according to the following criteria:

- Failing students.
- Students who represent the college or university in sports.
- Students who practice basketball games in sports clubs or institutions.

The percentage of the sample was (48.93) % of the community of origin.

In order to achieve parity between the research groups to prove the effect of the independent variable in learning the performance of the shooting skill from constancy in basketball the researcher used one-way variance analysis between the groups to find the significance of differences between the variables of age weight and height. As shown in table 2.

Table 2. ***Shows the analysis of the variation between research groups in variables (age weight height)***

Variables	Measurement Unit	Source of variability	Sum of Squares	Degree of freedom	Mean Squares	Calculator
Age	Years	Among the groups	21.748	1	21.748	2.921
		Within the groups	331.555	48	6.902	
Weight	Kg	Among the groups	15.856	1	15.856	1.988
		Within the groups	476.065	48	9.919	
Length	Cm	Among the groups	11.239	1	11.239	1.378
		Within the groups	527.348	48	10.999	

Where the Critical F-value of the two degrees of freedom (1.48) at the error level of 0.05 is 4.06. Since the computed F-value in the case of age weight and height is less

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than this critical F- value it can be concluded that there are no significant differences between the groups in these variables and is evidence of the equivalence of the totals in these variables.

Tools

The main tool in the study is an innovative electronic device that is specially designed to teach the skill of shooting from Persistence. The device is based on providing instant feedback on the motor angles of the elbow and wrist while performing a shot as well as directing sound signals to correct errors in movement.

Device Working Details

The purpose of the device: teaching the shooting skill of basketball fastness.

Working device: this device gives instant alerts about measuring the angles of movement of the skill to be corrected at once.

Device description: the device was manufactured by the microcontroller board (Arduino Uno R3). The device is connected by a special rubber backrest designed for the device to given vivacity when performing as the research sample wears it for test performance. The device has two input ports the first for the purpose of connecting electricity to the device as it works at voltages (5V) and the second port (USB) for the purpose of giving commands and programming the device. The device in turn holds two outputs for the purpose of connecting voltages (L N) in addition to signaling to the sensors.

The following tools were also used in the study:

- SPSS Version 26
- Surface Laptop Computer
- Basketball Hall.
- (8) basketballs
- Data registration form
- Tape measure
- Whistle

Shooting test of basketball constancy: (Hamoudat and Jassim 1999)

Name of the test: measuring the accuracy of shooting at players from the free throw line.

Method of performance

- The player stands in front of the free throw line from the outside of the forbidden zone inside the semicircle drawn above the forbidden zone.
- The player is given 25 attempts to shoot from the free throw line.
- The player starts shooting from the free throw line on the basket after being allowed to Shoot.
- The player scores the maximum number of successful shot attempts.

Recording

- The player is awarded one point for each of the successful shot attempts.

Instructions

The player executing the free throw must follow the following:

- The player can use any method of shooting from the free throw in such a way that the ball enters the ring from above or touches the ring without touching the ground.
- The player must shoot towards the basket within five seconds from the time the ball was placed in his reach by the test operator.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- The player must not touch the free throw line or the forbidden area behind the free throw line before the ball enters the ring.

Data collection

The data was collected in four stages:

1-exploratory stage: the exploratory stage aims to test the effectiveness of the innovative electronic device in learning to perform the skill of shooting from stability in basketball as well as to find out the suitability of the tools used and the experimental approach to be followed in the research. This stage aims to identify the challenges that may arise during the main experiment and ensure the accuracy of the procedures followed and was conducted on Sunday 08-09-2024 on a small sample from outside the research sample where students applied various exercises that depend on the device in order to learn the skill of shooting from stability.

2-the initial stage (pre-test): the shooting performance of the constancy of all participants was measured before the start of the experiment. The number of successful and failed shots was recorded and all the required data was taken into consideration for the variables.

3-training phase (experimental curriculum):

- Objective: the Objective of the training stage is to assess the impact of using an innovative electronic device on improving the shooting skill of stability in basketball in comparison with traditional methods in training. The focus was on examining the effectiveness of the electronic device in enhancing the accuracy of shooting and improving the overall performance of students in learning the skill of shooting from stability. The members of this group were trained using the innovative electronic device which helps to learn and improve the skill of shooting from stability.

-Duration of training: the training period has been set to be 8 continuous weeks. This period was distributed over two training units per week the duration of each training unit is 60 Minutes. Each training module was divided into dedicated training periods including shooting training using the device where the time structure of training was divided from the first week to the fourth week. Training on electronic devices is combined with the traditional method to stimulate improvement. From the fifth to the eighth week work is conducted to improve performance through continuous repetition and direct feedback. At this stage the exercises become more challenging and students are encouraged to focus on the goals set in each training module. The challenges of using the electronic device are increased by adding features such as providing real-time analysis of performance during training.

- Evaluation and follow-up: at the end of each week students' performance is evaluated using the free shooting test (with an average of 10 free throws) to measure progress. At the end of the eighth week students' performance is assessed using the same free shooting Test as well as on-the-spot analytical tests using the electronic device

4-the final stage (post-test): the goal of the final stage (post-test) is to evaluate the effect of the exercises applied during the training phase on the shooting skill of stability in basketball in participants of both the experimental group (which used the electronic device) and the control group (which used traditional methods). During this stage the improvement in the accuracy of shooting is measured in comparison with the performance in the pre-test (the test before the start of training) and the test was conducted on Sunday 10-11-2024.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Result

Table 3. ***Shows the arithmetic mean standard deviations and the value (T) computed for the control groups experimental and for the pre-and post-tests of the shooting from constancy in basketball***

Statement	pre-test	post-test	Arithmetic mean difference	Computed T-value	Degree of freedom	critical value of T	Semantics
Control Group (B)							
mean	5.1	6.3	1.2	4.5	48	2.01	**P)(0.05 >**
Standard deviation	1.35	1.25					
Experimental Group (A)							
mean	5.2	7.8	2.6	8.85	48	2.01	**)P(0.05 >**
Standard deviation	1.45	1.2					

As shown in table 3The results showed that the control group achieved a difference in the arithmetic mean between the pre-test and post-test of 1.2 where the arithmetic mean of the Pre-test was 5.1 and the standard deviation was 1.35 while the arithmetic mean of the post-test was 6.3 and the standard deviation was 1.25. The computed T-value was 4.5 which is greater than the critical T-value of 2.01 at 48 degrees of freedom and a significance level (0.05>P) which indicates the presence of statistical significance.

As for the experimental group it achieved a difference in the arithmetic mean of 2.6 between the pre-test and post-test where the arithmetic mean of the tribal test was 5.2 and the standard deviation was 1.45 while the arithmetic mean of the dimensional test was 7.8 and the standard deviation was 1.2. The computed T-value was 8.85 which is higher than the critical T-value of 2.01 at the same degree of freedom and level of significance which also indicates the presence of statistical significance.

Discussion

1-results for the control group

in connection with the pre-test and the post-test of the control group an increase in average performance from 5.1 to 6.3 was noted reflecting an improvement of 1.2 points. This improvement reflects the influence of traditional training on the skill of shooting from constancy. This improvement may be due to several factors such as exercise frequency direct guidance from instructors and student motivation within the classroom which can contribute to enhancing motor and technical interaction with the skill. However we find that this improvement is not significant enough since the computed T-value (4.5) was greater than the critical T-value (2.01) which indicates that the differences between the two tests were statistically significant at the level of 0.05.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

On the other hand the standard deviation in the control group was slightly reduced from 1.35 to 1.25 which indicates a better stabilization of performance among students after exercise. A decrease in the standard deviation may indicate that students have become more consistent in their performance which reflects some improvement in the level of accuracy in shooting. These results are consistent with the results of several previous studies that found that traditional training has an effect on performance improvement but its effect may be slow compared to modern training methods such as training using electronic devices (Hussain 2023).

2-results for the experimental group

as for the experimental group that used the innovative electronic device in training it showed exciting results as the arithmetic mean increased from 5.2 in the pre-test to 7.8 in the post-test indicating a significant increase of 2.6 points. This The obvious increase reflects the significant effect of the electronic device in improving the shooting skill of steadiness. This improvement can be explained in the light of many factors the most notable of which is that the electronic device provides instant and accurate feedback on imaging techniques allowing students to adjust their skills faster and more effectively. In addition the device helps to enhance reactivity and feedback which contributes to better motor learning and better application of skills.

The calculated t-value in this group (8.85) was significantly higher than the critical t-value (2.01) which shows that the difference between the pre-test and post-test was statistically significant (0.05>R). This suggests that the electronic device has a noticeable performance-improving effect compared to traditional training. Moreover we find that the standard deviation in the experimental group decreased from 1.45 to 1.2 which indicates an improvement in the stability of performance among students. This improvement in the standard deviation reflects the increased compatibility of students in the level of performance reflecting greater progress in learning the skill.

These results are supported by numerous studies such as (omoreji 2016) which confirmed the effectiveness of technology in the development of sports skills as these devices provide accurate information and instant feedback because they contribute to significantly improving performance techniques. Also a study (Salim et al. 2022) explained that technological systems help accelerate the learning of complex motor skills such as shooting in basketball providing accurate data that makes players able to analyze and improve their performance more quickly.

3-Comparison of the two groups

when comparing the two groups (experimental and control) we note that the difference between the pre-test and the post-test in the experimental group (2.6 points) was much greater than the difference in the control group (1.2 points). This suggests that the effect of the electronic device was greater and faster in improving the shooting skill of steadiness compared to traditional training. In addition we note that the changes in performance were statistically significant in both groups but the effect of the electronic device was more pronounced. This result confirms the findings of many recent studies that have shown that traditional methods may lead to gradual improvement but modern methods such as electronic devices achieve faster and more accurate improvement the results shown by the experimental group are in line with what many researcher have stated that the use of technology in training mathematical skills not only increases efficiency but also leads to improved learning strategies and increased motivation for students.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Technological tools provide a platform for more interactive and more personalized training (Idris et al. 2022).

Scientific interpretation of the results: the improvement in performance in the experimental group can be explained by the benefits provided by electronic devices such as providing instant feedback allowing participants to quickly adjust their techniques. These devices also allow users to review their performance in real time which helps them identify and optimize errors when they occur. According to a study (Idris et al. 2022) feedback is one of the main factors in accelerating the process of learning mathematical skills and modern training technology is an effective tool in accelerating the acquisition of skills and reducing the time it takes to learn.

As for the control group the limited improvement in performance can be interpreted as a consequence of traditional training that lacks immediate and accurate feedback. Traditional training may contribute to the improvement of skills over time but it does not provide the same level of reactivity and the ability to quickly correct mistakes as in the use of electronic devices.

Conclusions

The study concluded that the use of an innovative electronic device in training has a significant impact on improving the shooting skill of stability in basketball. The experimental group showed a significant improvement in its performance by 2.6 points between the pre-test and the post-test. By contrast the control group using traditional methods showed an improvement of only 1.2 points. Real-time feedback from the device enabled players to quickly correct mistakes speeding up the learning process and achieving better results. These results support the use of technology in sports training in particular for complex motor skills such as shooting. It is recommended to intensify the use of electronic devices especially at the initial stages of learning skills to achieve quick and effective results.

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Appendices

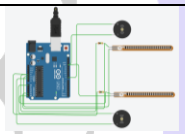
Appendix 1. Sample of the training curriculum (training modules)

Training module	Content	Duration of time	Exercises using an electronic device	Exercise intensity	Redundancy	Comfort	Objectives
Module 1: electronic device recognition	Learn how to use the electronic device and payment techniques.	60 Minutes	Practice shooting using the device to analyze the shooting motion of the fastness.	Medium	10 repetitions for each angle	30 seconds	Teach participants how to use the device and analyze their performance.
Module 2: Improve	Use the device to	60 Minutes	Shooting from	Medium	12 repetitions	30 seconds	Improve the shooting

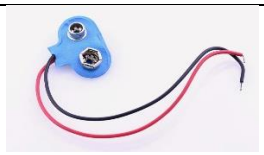
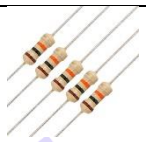
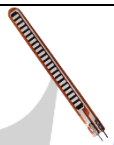
Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

shooting accuracy	analyze the accuracy of the shot from the fastness.		constancy with interaction with the device to find out the errors of shooting.				accuracy of the fastness by using instant feedback.
Module 3: multi-angle shooting	Shooting drills from different angles using the electronic device.	60 Minutes	Shooting from several angles using the device to measure the accuracy of shooting.	Medium	10 repetitions for each angle	45 seconds	Optimize shooting from different angles accurately using the device.
Module 4: advanced training on shooting from constancy	Advanced training using the device to increase confidence in shooting.	60 Minutes	Use the device to analyze and improve performance through instant feedback.	Medium	15 repetitions	20 seconds	Improve the shooting performance of fastness using technology

Appendix 2.

The electrical circuit of the device shows	
the final form of the device	
Microcontroller board (Arduino Uno R3)	
Connecting wire (Row Dupont Cable M-F)	
Connecting wire (Row Dupont Cable F-F)	

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Breadboard Jumper Wires	
battery connecter	
Carbon Film 10K Resistor	
Arduino Acrylic Transparent Case	
mobile vibration motor	
Flex sensor	

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Analytical Study of Touch Areas and Preparatory Movements Leading to The Touch in Epee Fencing in The Men's Team Final at The Paris 2024 Paralympics

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Abstract

In sports where technical performance is crucial, quantitative analysis methods have evolved to track skill performance using modern training methods and technology. This helps trainers evaluate training methods and detect performance issues. Coaches and athletes know that preliminary movements improve attack accuracy, but the association between motions (strikes, presses, crushes) and target regions (torso, armed arm, head) has not been thoroughly investigated. Lack of studies on Paralympic fencing's targeted contact regions and ambiguity around the most common preliminary actions highlight the research problem. The study examined epee fencers' successful movement sequences in the Paris 2024 Paralympic Games' final bouts and touch success rates by touch area (torso, head, armed arm). It also examined the use and success rates of anticipatory assault movements (strikes, pressures, crushes) by touch regions (torso, head, armed arm). To follow study procedures, researchers used descriptive and survey methods. Twelve epee fencers from Iraq, China, England, and Poland competed in the Paris 2024 Paralympics' final round. Technical and tactical performance focuses on touches from the armed arm as a near target, indicating competitive criteria, skill specificity, and players' knowledge in selecting locations that increase attack success, according to the study. The skillful performance of

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anticipatory assault movements depends heavily on strikes, moderately on pushes, and very weakly on crushes. Team tactics affect touch strategy diversity. Technically sophisticated teams focus on armed arm touches for tactical efficiency, while others use the torso to avoid counterattacks.

Keywords: Paralympic fencing, touch target areas, preparatory offensive movements, performance analysis.

Introduction

The Paralympic sport of wheelchair fencing is an expression of physical exercise; it has its own athletics, social goals and purposes in education and psychotherapy. It has developed from fencing in the past through various stages and ways, to what it is today that it is played with the respect of special laws determined by organizations that have assumed responsibility for competing among opponents without any aid form outside while playing excepting the etiquette expected by this outset noble game which sustained its heritage. The basic theory is that of touching your opponent before they can touch you: three classes in the sport. This requires the fencer to perform offensive and defensive actions of movement that increase mobility, and preparations that help make openings. This requires a great deal of fine motor control and aim to point the weapon at the final target, in order to score a valid touch. "The world now A aspires to what is useful, effective and achiever expedient and tries to save time, effort and money" (Fouad & Hamid 2022). Perhaps the most outstanding illustration of these points is in Paralympic fencing, for two reasons, proximity between opponents and the complexity of motor skills: the short distance separating them and the highly sophisticated characteristics of those measured make it requisite that athletes must continuously improve their physical-motor attributes to increase their performance. Moreover, they have to develop the Game strategy that can optimally have offense and defense technique with rapid and correct motor response which are primarily important in this sport. Moreover, "the overarching goal of Paralympic fencing is to execute a legally prescribed target number of hits using the most suitable methods in terms of skill performance means, through extension of the armed arm or advancing it" (Hussein, 2021, p. 23).

Extensive development in analytical methods in sport, using the most current training methodologies and technological instruments to monitor the movement path of skill performance, particularly applicable to sports that has technical performance as a major part of its task while training aid coaches in evaluating the quality of their assistance programs and identifying gaps that need filling. Research on performance analysis has provided numerous valuable insights and contributed to the development of important strategies for enhancing athletic performance. Such research presents various realistic findings that open avenues for diverse and related topics of study, especially in Paralympic

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

fencing, encompassing all aspects related to the development of this sport globally, while also benefiting from all previous experiences in various directions.

"Analyzing artistic and creative production is one of the means of evaluating behavioral situations and athletic performance; it is a productive, artistic, and creative process" (Mousa, 2000). Several studies have addressed the topic of analysis in Paralympic fencing and other sports, including a study by Hussein (2021) aimed at understanding the values of kinematic variables in the performance of the thrust skill across the three weapons in fencing, as well as identifying the differences in kinematic variable results in the performance of the thrust skill among the three weapons in fencing, in addition to determining the contribution ratio of certain kinematic variables in the stages of performing the thrust skill for the three weapons in fencing. The researcher employed a descriptive methodology to achieve the study's objectives, and the sample included the best six players from each of the three weapons, totaling 18 players, representing 100% of the research population. The sample was intentionally selected as they are considered the elite among the candidates for the national fencing team due to their high technical performance level. Another Ali (2013) study was conducted to determine the performances of offensive team skills in the women's volleyball league in 2013 and their relationship with competitive ranks. The researcher also used descriptive approach for its relevance to the problem, and the sample was taken from the best four clubs in Iraqi club's league to represent the highest sporting category) professionalism (of the Iraqi clubs. Furthermore, the goal of the study conducted by Mohammed (2012:190) was to determine factors influencing game performance among male wheelchair basketball teams who took part in Beijing 2008 Para-Olympic games and assess player's skills levels at research site. The author used an appropriate methodology with respect to a description, and samples contained Iranian, Canadian and German teams.

Relevance The present study provides accurate data concerning the epee, including information on the region being targeted most often-torso (red), head (blue), and arm holding weapon (green)-and preparatory actions that precede attacks such as blade-work actions: hits, pressure points and crushing actions. This information will assist coaches in developing appropriate plans or lessons tailored to the weapon's requirements through analysis or comparison. "This collection of information will aid fencing coaches and instructors in creating a systematic and organized instructional lesson for individuals and groups aimed at achieving successful and efficient performance on the fencing strip" (Vincent H. Bradford, 2003). Furthermore, to the best of the researchers' knowledge, there are no studies addressing the topic of technical analysis of touch areas and preparatory movements in this manner for Olympic matches in the epee weapon.

There is also a similar study that indicates the effectiveness and outcomes of attacks using weapon movements by epee fencers in the current qualification competitions aimed at developing fencing. The study analyzed 30 local and foreign players with high technical

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

skills. It confirmed that attacks using weapon movements ranked foremost among the types of attacks in high-level fencers' performance, while the proportion of attacks using arm movements constituted 21.5% of the total attacks, with a success rate of 27.6%. Consequently, the importance of this research is summarized in its provision of a database for coaches regarding the most frequently targeted areas in the legal target with the epee in Paralympic fencing, as well as assisting coaches and players in developing more effective offensive and defensive strategies. Additionally, it contributes to the preparation of training programs focused on improving touch accuracy and the speed of preparatory movements, providing a scientific foundation for studying complex tactics in Paralympic fencing.

The analysis of successful movement sequences of epee fencers during the final matches of the Paris 2024 Paralympic Games aims to identify the proportion of successful touches concerning the touch areas (torso, head, armed arm). It also seeks to determine the proportion of preparatory movements used for attacks (strikes, pressure, crushing) by epee fencers during the final matches of the Paris 2024 Paralympic Games, as well as the proportion of preparatory movements used for attacks (strikes, pressure, crushing) according to touch areas (torso, head, armed arm) by epee fencers during the final matches of the Paris 2024 Paralympic Games.

Methodology

Researchers also intended to choose the best method fit in order to solve the problem. In this framework, the researchers used a descriptive survey approach that is similar to the method in which study was conducted. The study sample included epee fencers competing at the Paris 2024 Paralympic Games, a total of 36 athletes. The research sample was purposive and reached the finalists (12 players) of the epee team event in Paris 2024 Paralympic Games teams for Iraq, China, England and Poland.

This consisted of 18 team bouts, with the third-place play-off between England and Poland (9 bouts) and final between Iraq and China (9 bouts). Methods The research approach consisted of a process with several stages: Paralympic fencing is one of the modalities foreseen in the program of the Paralympic Games and its practice has been characterized as competitive, since fencers strive over a period of quadrennium to achieve the highest number of points, which allows them to participate in an official competition at the Paralympics according their ranking. So a fencer competing at the Paralympic Games is most definitely elite and that just shows how strong the field is. The researchers chose the finalists because they are the cream of the crop.

Movements sequences of the research were defined since Paralympic fencing is a sport which can only be practiced in individual form and consists of various movements and fencing actions that are essential in its matches. The opposing fencers engage in a series of individual actions (sequences) as they try to score, or work at scoring touches. These

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

series may end with a légal touch, an illegal one or no touch at all. The successful fencing sequences were studied, and for the attacker we started from the preparation movements performed by the fencer before starting to reach a legitimate touch, and in particular knock, press and crush. For this study, the data were obtained through observation and collection of information by analyzing video recordings of official matches made at normal speed and the successful actions extracted from these situations after repeated visual analysis, using Kinovea analysis software. Total number of recorded touches across all team encounters was 154, representing the analysis of 154 successful fencing attacks.

Research Community and Samples

The term "community" refers to "all the elements of the phenomenon that the researcher studies, or all individuals, persons, or objects that constitute the subject of the research problem" (Al-Saadawi & Al-Janabi, 2013, p. 30). Therefore, the research community is intentionally defined as the administrators and coaches of the sports clubs under the Ministry of Interior of Iraq, totaling (235) individuals, who are distributed across (6) clubs, representing a percentage of (100%). The research samples are divided as follows: 1. Pilot Test Sample for the Scale: The researcher selected a pilot test sample from Al-Hudood Sports Club through a random draw, consisting of (8) individuals, which represents (3.4%) of the research community, specifically the personnel (administrators and coaches) of the Ministry of Interior's sports clubs. 2. Scale Construction Sample: The sample for scale construction was chosen randomly by the researcher, comprising (86) individuals, representing (36.5%) of the total community of the sports clubs under the Ministry of Interior, which consists of (6) clubs. 3. Final Application Sample for the Scale: The sample for the application of the study scales included personnel, specifically the administrators and coaches of the sports clubs under the Ministry of Interior, totaling (98) individuals, which accounts for (41.7%) distributed across (6) clubs.

Research tools

1. Computer device of type (Dell)

2. Kinematic analysis software (Kinova)

3. A form for recording preliminary attack movements and touch areas

Statistical Methods

1. Percentage = part ÷ whole × 100

Results

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Table 1. *Distribution of Total Touches and Percentage Values According to Touch Areas (Trunk, Head, Armed Arm)*

Variables	Total Touches	Percentage
Trunk	62	40.259%
Head	0	0%
Armed arm	92	59.740%
Total touches	154	100%

Table 2. *Percentage Distribution of Preparatory Offensive Movements (Beat, Press, Crush)*

Variables	Total Touches	Percentage
Beat	49	58.333%
Press	32	38.095%
Crush	3	3.571%
Total touches	84	100%

Table 3. *Percentage Distribution of Preparatory Offensive Movements (Beat, Press, Crush) According to Touch Areas (Trunk, Head, Armed Arm)*

Variables	Total Touches	Percentage
Beat + trunk touch	21	25%
Press + trunk touch	14	16.666%
Crush + trunk touch	3	3.571%
Beat + armed arm touch	28	33.333%
Press + armed arm touch	18	21.428%
Crush + armed arm touch	0	0%
Total touches using preparatory movements and touch areas	84	100%

Table 4. ***Percentage of Successful Touches According to Touch Areas (Trunk, Head, Armed Arm) for Epee Fencers (Iraq, China, England, Poland)***

Teams	Total Touches	Trunk Touches	Armed Arm Touches	% Trunk Touches	% Armed Arm Touches
China	45	18	27	40%	60%
Iraq	36	25	11	69.444%	30.555%
England	45	8	37	17.777%	82.222%
Poland	28	11	17	39.285%	60.714%

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

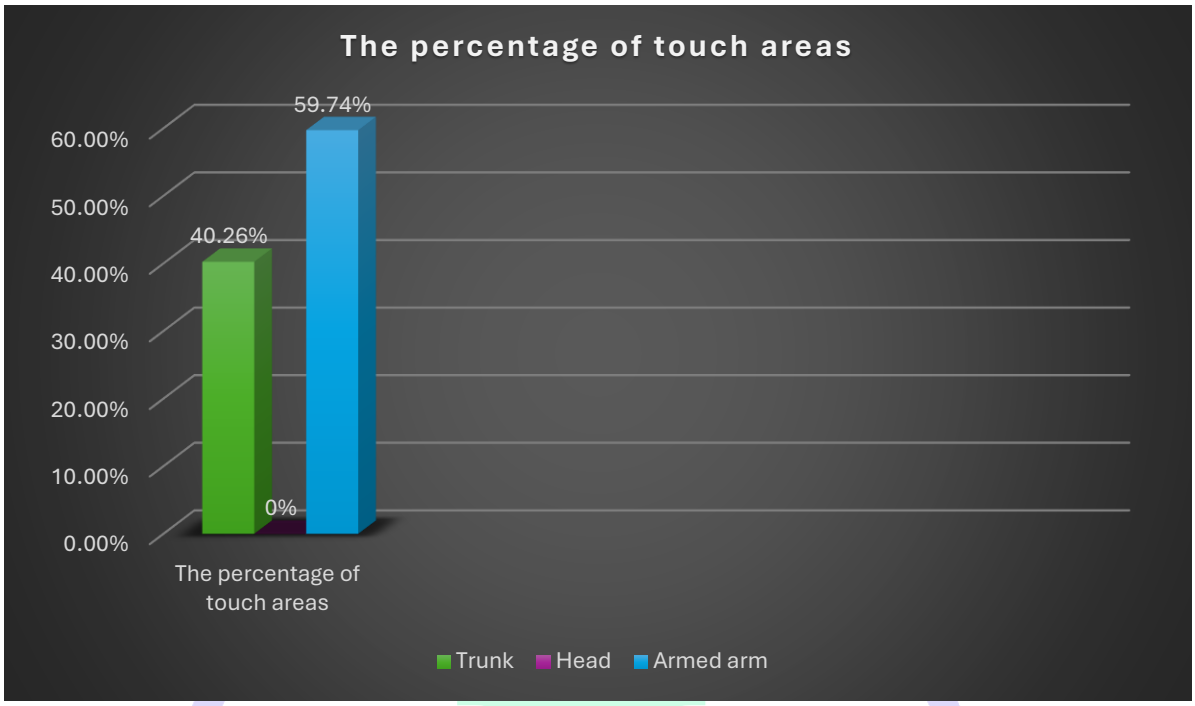

Figure 1. *illustrates the percentage of touch areas*

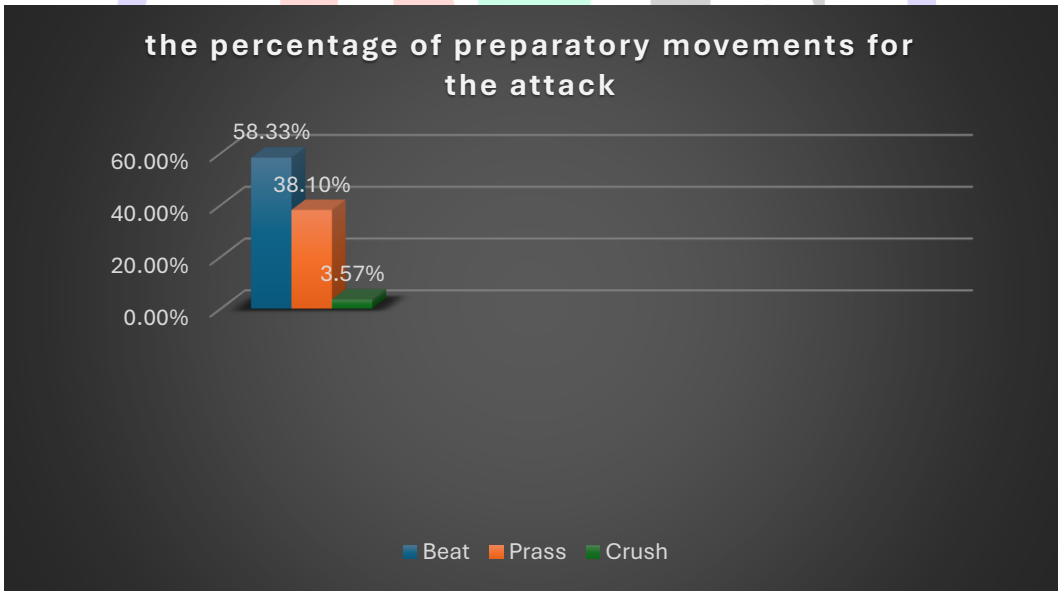

Figure 2. *illustrates the percentage of preparatory movements for the attack*

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

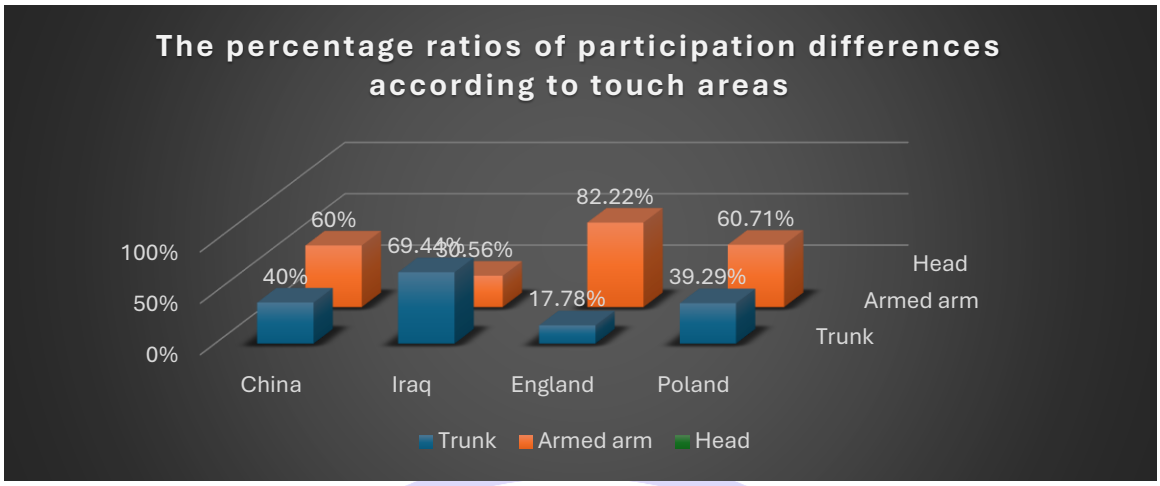

Figure 3. *illustrates the percentage of successful touches in relation to the target area (trunk, head, armed arm) for epee fencers from Iraq, China, England, and Poland*

Discussion

The striking has been shown to be clearly superior with (58.333%) as noticed in Table (2). This finding suggests that the user group of our study primarily preferred one-step direct and rapid taps, known to have high effectiveness in minimizing task time and ensuring accuracy. This is supported by Schmidt and Lee (2019) who suggest that "quick movements with minimal motor requirements are more often used in competitive situations being their high effectiveness and low error cost." Pressure touches ranked also second but only made up (38.095%) due to their application in contexts where better control of the performance is required, even if had smaller percentage than striking cones actions derive from their increased time of execution. This is supported by Williams (2018) who suggested that “strategies that depend on control and stability are applied less often in the course of rapid competitive performance even though they may provide solutions for certain conditions”. Conversely, crushing touches contributed with the lowest probability (3.571%), as evidence of their small influence. Majid (2022, p. 96) confirms that "skills with high complexity and significant physical demands see a reduced frequency of use unless they achieve direct effectiveness commensurate with their difficulty." Furthermore, Abbas and Mahdi (2012, p. 122) state that "modern training theories in fencing do not permit much execution of the crushing movement due to the rapid reactions of experienced players in executing touch registrations, as evidenced in recent championships, in contrast to striking, which is performed quickly with highly reactive and direct responses." Majid (2022, p. 96) also mentions that "when executing the crushing skill, it must be performed at high speed without fragmentation of the movement, paralleling the speed of executing the striking skill to make it difficult for the defending player to change direction and disengage."

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table (1) illustrates the distribution of touches between the armed arm and the torso, with a clear superiority of the armed arm at a percentage of (59.740%). This result indicates that the armed arm represents the most effective target during performance, due to its proximity to the opponent's weapon tip, as well as being the closest target for the opponent. This corresponds to Schmidt and Lee (2019), who found that players attack locations where precision is necessary or that are more likely if you are successful in competitive performance situations. Percent (%)The vast with a proportion of (40.259%), representing it as source an alternative effective in the event that access to the armed arm is difficult, especially if attack on armed arm has failed and continued the attack of torso. This outcome is in line with that of Williams (2018) who stated that larger target areas are often targeted when trying to gain a touch even though they require immense physical exertion to bring the opponent's sword tip to the legal touch area.

Conclusions

1- The technical and tactical performance clearly tends to focus on obtaining touches from the armed arm as the closest target to the opponent, which reflects the nature of competitive requirements and the specificity of skill in this type of performance, in addition to the players' awareness in selecting areas that enhance the chances of a successful attack.

2- The skillful performance of the preparatory movements for the attack largely depends on the cutting attack (strike), with a moderate use of the cutting attack (for pressure), and a very weak application of the cutting attack (for crushing).

3- The diversity of touch strategies is related to the tactical aspect of the team, as teams that are advanced in technical skills tend to focus on obtaining touches from the armed arm due to their tactical effectiveness, while some teams rely on the torso as a safer option to avoid counterattacks.

Recommendations

1- The implementation of specialized training utilizing modern devices and tools aims to enhance the accuracy of touch in the armed arm.

2- The adoption of specialized training employing modern devices and tools seeks to develop preliminary movements for a more effective attack.

3- The design of defensive plans targets the protection of areas most susceptible to touch (the armed arm).

4- The use of video recording in accordance with motion analysis and analytical programs is conducted periodically to monitor player development.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

5- The integration of practical tests to measure touch accuracy within training programs, particularly those that simulate the game and encompass all legal touch areas, is essential.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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The Effect of Combined (Physical - Skill) Exercises Using a Designed Device on Developing Some Shooting Skills for Basketball Players Under 18

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Abstract

The study aimed to identify the effect of combined (physical - skill) exercises using a designed device on developing certain shooting skills for basketball players under 18 years old. The researchers used the experimental approach on a sample of 14 players, divided into an experimental group and a control group.To achieve the study's objectives, the researchers designed a basketball shooting development device, which consists of a rotating base, poles, and a main body, in addition to an electronic system that rotates the device towards the player approaching the proximity sensors.The researchers also prepared a set of physical and skill exercises using the designed device. These exercises were applied to the experimental sample for eight weeks, with three training sessions per week. The researchers concluded that the combined exercises using the designed device had a positive impact, leading to the superiority of the experimental group over the control group.

Keywords: Basketball, Device, Shooting, Combined Exercises.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Compound exercises are one of the most important exercises in the game basketball, which works to develop the skill and physical side of the basketball player "as it combines more than skills in one exercise or more than one physical or motor aspect with the skill and is performed in the different stages preparation (Zhang, et al, 2024), as well as its diversity that helps to increase the elements of desire and excitement when practicing it, and the nature of these exercises is close to what happens within matches or competitions from defense, attack, deception, surprise by players, change direction and other tactical methods, and these exercises are performed under physical and psychological pressure but in an organized manner that can be stopped and directed by the coach, and the shooting skill in basketball is an important skill, as shooting is the last duty that the player performs (Al-Attar, 2004, page 49) indicates that "shooting is the final stage of the team's attack, and all the skills performed in combination with the cooperation of team members are only a preparation for the shooting process on the basket." And shooting is the process of pushing the ball towards the target in the form of a throwing movement using one or two arms, as shooting aims to move the ball from the player's hand to enter the basket.

As a result of the development witnessed by the world in the game of basketball and to improve the level of performance of players and the researcher's work in the field of teaching, she noticed a weakness in the accuracy of shooting and the lack of modern sports equipment that may contribute significantly to the development of players' performance, so the researcher worked to study the issue and find solutions to overcome it to keep pace with the development by designing a proposed device to develop shooting and players' reach to the required level, so the researcher decided to design a device to develop the accuracy of shooting.

The study aimed to: Design a proposed device to develop shooting for basketball players under the age of 18, prepare complex exercises using the designed device to develop the shooting skill for basketball players under the age of 18, identify the differences between the arithmetic means of the results of the post-tests between the experimental and control groups in shooting skills.

Many researchers studied the subject of this study, including the study of (Abdullatif, 2008), which aimed to design an assistive device in learning the skill of scoring from stability in basketball and to identify the effect of using the assistive device in learning the skill of scoring from stability in basketball, and the researcher used the experimental method on a sample of basketball players The researcher concluded that the proposed device as an aid has an effective role in learning the required skill, and that the use of the proposed device saves effort and time for the trainer and the learner in learning the skill of scoring from stability well and is suitable for teaching this age group, and (Al-Araji, 2014) studied special exercises using The study aimed to identify the most important biomechanical variables of the shooting

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

skill of young basketball players and to prepare special exercises according to some biomechanical variables using the vertimax device to perform The researcher concluded that the difference is clear in the change in the angular velocity of the swing leg as a result of the weakness of most members of the research sample, as this increase worked to positively affect the rest of the variables in the stages of promotion and departure, while the study of (Khamas, 2015) aimed to The researcher used the experimental method on a sample of 20 youth basketball players and concluded that the proposed device and its special exercises have a positive effect on the development of the accuracy of the jump shot skill for the first experimental group, and that the proposed device has a positive effect on the development of the accuracy of the jump shot skill for the second group and that the skill exercises have a positive effect on the development of the accuracy of the jump shot skill for the second group. For the first experimental group, the proposed device has a positive effect on the development of the accuracy of the jump shot for the second group, and the skill exercises have a positive effect on the development of the level of accuracy of the jump shot for the third group, and the researcher concluded that the devices used in the training units increase the motivation of the players to continue playing and excitement. The study (Wali, 2019) aimed to design an assistive device (ball collector and angle limiter) for basketball shooting skill and prepare special exercises using the designed device according to smart ball information and its effect on the accuracy of some types of shooting for advanced basketball players and to identify the effect of special exercises using the designed device according to smart ball information on the accuracy of some types of shooting for advanced basketball players and to identify the effect of special exercises using the designed device according to smart ball information in The researcher concluded the superiority of the two research groups (control and experimental) in shooting skills (from stability, jumping and three-point jumping) and in favor of the post-tests and the superiority of the experimental group that trained according to the designed device over the control group in the post-tests of the shooting skills under study. As for the study of (Mubasher, 2021), it aimed to design a motor response test device for basketball players, and to identify the effect of motor response speed exercises using the (Xtra- MAN) device The researcher used the experimental method on the research sample of (12). The study concluded that the researcher's modified Xtra-Man exercises are preferable to the exercises prepared by the trainer in the development of peaceful shooting, two-point shooting, and three-point shooting. (Jabbar and Ali, 2022). The researchers adopted the experimental method with a single group design with two pre and post tests on a sample of (12) players, and the researchers concluded that the compound exercises were effective in developing the explosive strength of the legs, the explosive strength of the arms, and the development of the skill aspect.

The study (Ali, Abdul Mohsen, and Saleh, 2024) aimed to identify the effect of TRX training using Bosu ball on the development of passing for female basketball players as well as the effect of TRX training using Bosu ball on the development of some physical abilities

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

for female basketball players, and concluded that there are statistically significant differences between the mean of the two preliminary measurements in favor of the first experimental group using TRX using Bosu ball in favor of the first experimental group using TRX using Bosu ball, and statistically significant differences between the mean of the two dimensional measurements in favor of the first experimental group using TRX using Bosu ball on the development of passing and some physical abilities of female basketball players, and the effect was clear and canceled on the physical elements under investigation. Finally, the study (Muslim and Khudair, 2025), which aimed to know the effect of complex mental exercises on some motor abilities and offensive skills of young soccer players, the researchers used the experimental method for the suitability and nature of the research, and the experiment was carried out on a sample of young soccer players, whose number (24) players and ages (17-19) years old and were randomly divided into two groups, with (10) players for each group, the experimental design was adopted, which is called the design of equal groups with an experimental design with a test (pre-post), and the researchers concluded that the complex mental exercises worked to develop the motor and skill abilities of young football players.

Method and Tools

The researcher used the experimental method as it is one of the method that achieves the research objectives and hypotheses, the research population included the players of the six Baghdad education directorates under the age of (18) years and their number (89) players and the research sample was selected by random method (lottery) from the six directorates and the research sample was represented by the players of Baghdad Karkh I education (17 players) and three players were excluded to conduct the exploratory experiment as the sample consisted of fourteen players, then the sample was divided equally into two control and experimental groups.

The proposed device is designed to improve aiming

The designed device consists of the Xtra Man (SKLZ DMBK-000-02 D-Man), which works as a defender, which in turn consists of the following parts:

1.Base: The base of the figure: It is a hollow plastic base with a diameter of (40) cm, which can be filled with water or sand to weigh it down.

2.Columns: The device consists of three hinged columns with two connectors, the columns are installed with each other, and then attached to the base.

3.The body of the beam: It is a frame of plastic tubes with a diameter of (0.5) cm foldable, with dimensions (12.50 x 60 x 50) cm, covered with a transparent plastic fabric (Arokanza) in the form of a grid similar to the position of the defender's movement.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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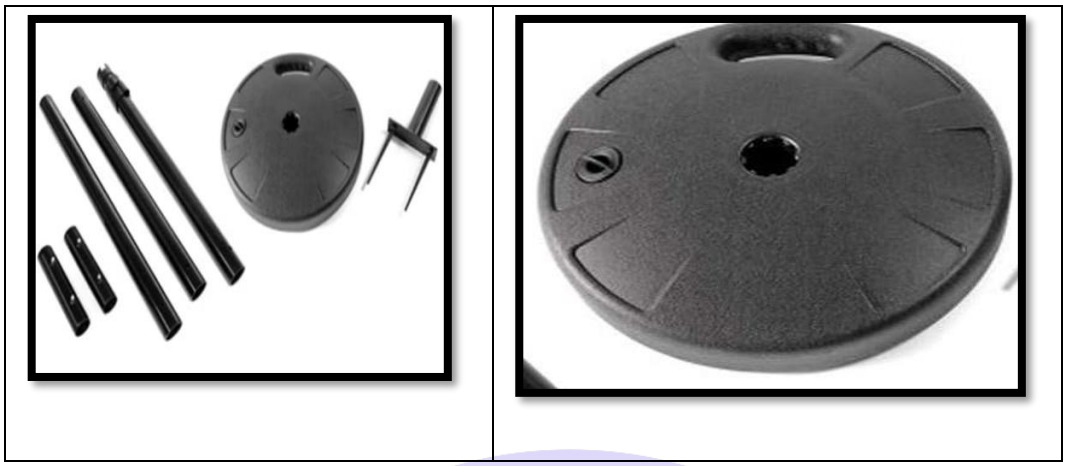

Figure 1. *Base and columns*

Figure 2. *Device body*

4.Factory electronic part.

A. Ultrasonics Sensor: Ultrasonic sensors measure the distance that is determined according to the exercise, as it emits high-frequency sound waves that the human ear cannot hear, and when these waves collide with an object, they bounce back in the form of an echo, when these waves bounce back, they are sensed and sent to the microcontroller for processing.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

B. Spindle motor: A Stepper Motor was used with the following specifications: (BEMONOC 12v DC Motor 160 RPM Dc Worm Geared Motor with Metal Gear Box for Diy Parts),

This type of motor is a high-torque motor with a voltage of (12) volts that can change its speed and is one of the most powerful types of developers that are suitable for high-torque projects.

C. Microcontroller: It controls the reception of the signal from the distance sensor and is processed and then sends a signal to the stepper motor (motion developer) to move towards the attacking player to be an obstacle similar to the defender. The researcher will use the reception and control system consisting of a microcontroller (Arduino microcontroller).

Method of work

Electron beam: It is a D-man dummy It is a D-man representing the defender whose body side is opposite to the attacking player, with a height of two meters, which can be increased and decreased according to the height of the players, and rests at the bottom on a plastic base so that the vertical lip is installed on a rotating pulley and on the head of a rotating motor (motor) of a type of motor that can be rotated according to the angle required, i.e. rotating at an angle of 90, 45 or any angle according to the need in the prepared exercises That is, it rotates at an angle of 90 or 45 or any angle according to the need in the prepared exercises, and this motor is equipped with a driver (driver), which in turn is connected to a controller that responds to the signal from the distance sensor, that is, when the attacking player approaches, the doll rotates at the same angle as the attacking player is an obstacle to scoring.

Search tests

Shooting the basket from the side (Allawi & Radwan, 2001, p. 210).

- Two lines are drawn on each side of the court and 20 feet away from the basket.

- The player stands at his assigned line and shoots (10) consecutive shots at the basket and then moves to the other side of the court to shoot the other shots at the same distance.

- Total shots on the basket (20) Twenty shots, ten shots from each side

- The player is allowed to shoot at the basket with one hand or with both hands.

- Each player is given one attempt to practice before the test on each side.

Calculation of scores

- Two (2) points are calculated for each ball that enters the basket.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

- One (1) point is calculated for each ball that touches the hoop but does not enter it.

- A player's score is the sum of the points he gets from the twenty shots.

- The maximum score is (40) points.

Jump Shooting Accuracy Test (Almajid and Majeed, 2016, page 8)

The player shoots the ball at the basket in three sets of (5) consecutive shots from the center of the free throw area and on both sides, and each player gives one appropriate time between each set as shown in the figure

Calculation of points: Two points are calculated for each ball that enters the basket and one point for each ball that touches the hoop and does not enter, while the tester's score is equal to the sum of the points obtained in the fifteen attempts, noting that the maximum score is 30 points

Shooting test from the peaceful movement after performing the dribble (Cesar, 2022, page 7)

Method of performing the test: The tester performs the dribble from the center of the court towards the target to perform the triple and then the peaceful shooting

Test conditions: The tester will be given (10 attempts) to shoot and must perform the dribble and triple legally.

Points are calculated, and each successful attempt is worth one point. The highest point total that can be obtained by the tester is ten points

Application of exercises

The researcher worked on the application of the prepared exercises, which contains compound exercises (physical and skill) in addition to the designed device and after it was presented to experts to ensure the realization of compound exercises consisting of 24 training units, the researcher used the method of repetitive training and high-intensity interval training. The duration of the proposed main experiment lasted (8 weeks) and the number of total training units (24) training units (3) units per week and the time of one training unit from (30 - 45) minutes at the beginning of the main section of the training unit.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Result

Table 1. Mean Scores, Standard Deviations, and t-test Results for Pre- and Post-shooting Tests of the Control Group

Test	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	t-value	Sig.	Significance
Standing shot from the right side	8.000	1.528	12.000	2.236	5.53	0.001	Significant
Standing shot from the left side	8.429	1.618	10.571	3.309	2.50	0.047	Significant
Jump shot	20.000	3.367	23.429	4.392	4.77	0.003	Significant
Lay-up shot	3.000	1.414	6.286	1.704	5.42	0.002	Significant

Note. Results are statistically significant at $p \leq 0.05$ with 6 degrees of freedom.

Table 2. Mean Scores, Standard Deviations, and t-test Results for Pre- and Post-shooting Tests of the Experimental Group

Test	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	t-value	Sig.	Significance
Standing shot from the right side	9.714	2.812	16.714	1.380	7.000	0.000	Significant
Standing shot from the left side	10.286	1.704	15.286	2.138	6.355	0.001	Significant
Jump shot	19.857	1.952	26.143	2.268	8.800	0.000	Significant
Lay-up shot	3.286	2.360	8.714	0.951	5.729	0.001	Significant

Note. All differences are statistically significant at $p \leq 0.05$ with 6 degrees of freedom.

Table 3. Differences Between Post-Test Skill Performance of the Experimental and Control Groups

Test	Experimental Group Mean	SD	Control Group Mean	SD	t-value	Sig.	Significance
Standing shot from the right side	16.71	1.38	12.00	2.24	5.47	0.000	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Standing shot from the left side	15.29	2.14	10.57	3.31	3.17	0.010	Significant
Jump shot	26.14	2.27	23.43	4.39	2.55	0.030	Significant
Lay-up shot	8.71	0.95	6.29	1.70	3.29	0.010	Significant

Note. Differences are statistically significant at $p \leq 0.05$ with 12 degrees of freedom.

Discussing

The results achieved for the experimental group came as a result of the compound exercises applied by the researcher to this group, and her regulation of the components of sports training load, as the process of advancing in the level of various physical abilities occurs as a result of organizing the components of training and the correct exchange between work and rest (Johe, 2020, p. 266), as "organization in training is one of the most important fundamentals for the success of the training process, as it relies on achieving training goals. It includes organizing all training components, the number of units, timing, performance method, and everything related to the training process (Bompa & Buzzichelli, 2018). Considering that this principle is closely related to the priority principle in training by providing exercises and components that yield better training outcomes and prioritizing them when organizing training programs, it becomes a foundation thru which the athlete follows the training process.

On the other hand, the researcher attributes the achieved results to the effectiveness of using the manufactured device, which in turn reflected the shooting skill, as the manufactured device and through being a mobile device that rotates towards the player's location and the exact time of arrival, which simulates what happens inside the field, as the researcher believes that this feature of the designed device and the compound exercises prepared by the researcher had a great and comprehensive impact on the player's body, whether in the quality of performance or the level of performance, in addition to that, the researcher believes that the factor of excitement and renewal "is one of the conditions that must be met by the exercises must be different and varied for the purpose of the comprehensive impact on the body and away from boredom and instilling a spirit of challenge. The researcher believes that the factor of excitement and renewal "is one of the conditions that must be met by the exercises must be different and varied for the purpose of the comprehensive impact on the body and away from boredom and spreading the spirit of challenge, as the use of different means, training tools and devices makes the sports training process more effective and positive because their use helps to build the player's motor perception and makes him live in an atmosphere similar to the game and thus the options he has during performance are many.

The researcher attributes the achieved results to the effect of the designed device, as this device transfers the skill performance from silent performance to high-stimulation motor performance. The movement of the device toward the player during the shooting skill gave

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

the individuals in this sample a greater opportunity to harmonize with the exercises, providing a positive addition that makes the skill performance more exciting and engaging. This achieved an important goal, which is that the repetitions of the compound exercises prepared by the researcher were performed with strength and speed, precise performance, and the player's attempt to harmonize with the movement of the device and its movement toward the player at the moment of shooting. Sources indicate that the correct repetition of physical or skill performance is one of the most important factors in achieving the desired goal of the exercise (Khasaf, 2023). This aligns with what Jabar and Ali (2022, p. 9) mentioned, that compound exercises are one of the modern training approaches characterized by significant difficulty and challenge, which greatly benefit the development of abilities and skills in basketball and the advancement of players' levels, especially among age groups.

The researcher believes that compound exercises using the designed device have created the required harmony and synchronization between the muscular and nervous systems by speeding up the transmission of impulses from nerve cells to muscle cells, the rapid transfer to the entire muscle, and their coordination in working with other muscles, as well as the performance compatibility between the muscles. "All of this leads to a state of functional adaptation in the muscular-nervous work."

The researcher attributes this superiority to the compound exercises applied to the members of the experimental group, which included a set of physical and skill exercises using the designed device. These exercises encompassed upper and lower body muscle exercises, trunk muscles, as well as transitions during performance on the designed device, which faces the athlete during performance. These movements and transitions made the performance similar to that on the court, with movement in different directions. Bhardwaj & Kathayat (2021, p. 2) indicate that basketball is characterized by dynamism, continuous and sudden fast sprints along the court, with or without the ball. It is also characterized by variations in rhythm, as well as continuous movements in all directions, receiving, passing, moving to assist or block, and shooting. 2) that basketball is characterized by dynamism, continuous and sudden fast sprints along the court, with or without the ball. It is also characterized by variations in rhythm, as well as continuous movements in all directions, receiving, passing, moving to assist or block, and shooting. Here, the researcher indicates that the exercises on the designed device directly targeted the abilities that contribute directly to the development of explosive strength capabilities characterized by speed, agility, balance, and motor coordination. These "abilities and others are what a basketball player relies on within the court" (Wali, 2019, p. 7).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Appendix

Appendix 1. The exercises used

Exercise (1) Front Support. Exercise (1) Front support.
Exercise (2) varied abs. Exercise (2) varied abs.
Exercise (3) Knee Flexion and Extension. Exercise (3) Knee Flexion and Extension.
Quick run 20 meters. Exercise (4) Sprint 20 meters.
Jumping as high as possible with both feet while throwing a medicine ball. Exercise (5) Jump as high as possible with both feet while throwing a medicine ball.
Exercise (6) Various abdominal exercises. Exercise (6) Varied abdominal exercise.
Front plank on a medicine ball. Exercise (7) Front support on a medicine ball.
Exercise (8) Cross-legged between two partners, performing an abdominal exercise while alternating throwing the medicine ball between them. Exercise (8) Foot entanglement between two partners performing an abdominal exercise with alternating throws of a medicine ball between them.
Exercise (9) Bending and extending the knees while throwing the medicine ball upwards during the extension. Exercise (9) Bending and extending the knees while throwing the medicine ball upwards during the extension.
Exercise (10) Hop for a distance of 10 meters. Exercise (10) hop for a distance of 10 meters.
Exercise (11) from lying down, lifting the legs up.
Exercise (12) Jumping over 10 low-height hurdles for a distance of 5 meters.
Exercise (13) Jumping on both sides of the platform.
Exercise (14) Bending and extending the knees while jumping upwards.
Exercise (15) Passing in front of the sensor and when the device rotates, shooting by jumping.
Exercise (16) Tapping and passing, then receiving and passing in front of the sensor, and when the device rotates, shooting by jumping.
Exercise (17): Running and passing in front of the sensor while receiving the ball, and when the device rotates, shooting while jumping.
Exercise (18): Running from two players, one from the left and the other from the right, to pass in front of the sensors with a 3-second delay between them to reach the device and perform a jump shot.
Exercise (19): Receive the ball, then pass in front of the right sensor and perform a smooth shot after the device turns toward the player. Then run toward the left sensor, receive the ball, perform a jump shot, and change direction.
Exercise (20) Upon command, the player runs without the ball, then receives the ball from the assistant near the free-throw area and performs a jump shot in front of the designed device.
Exercise (21) Upon the signal, the player runs and receives the ball from the assistant, then performs dribbling and shooting by jumping in front of the designed device.
Exercise (22) Upon command, the player runs quickly and receives the ball from the assistant, who stands near the free throw area, then performs a stationary shot in front of the designed device.
Exercise (23) Upon command, the player runs quickly, receives the ball from the assistant, and shoots from a stationary position in front of the designed device.
Exercise (24) Upon command, the player runs quickly and receives the ball from the assistant, who stands along the sideline of the basketball court, and performs dribbling and shooting from a stationary position in front of the designed device.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Exercise (25) Upon command, the player runs quickly and receives the ball from the assistant, who stands near the free-throw area, and performs a smooth shot in front of the designed device.
Exercise (26) The player runs without the ball, then receives the ball from the assistant near the free-throw area and shoots by jumping in front of the designed device.
Exercise (27) Upon command, the player runs and receives the ball from the assistant, then performs a dribble and a jump shot from in front of the designed device.
Exercise (28) Upon the command, the player runs quickly and receives the ball from the assistant, who stands along the sideline of the basketball court, and performs dribbling and a smooth shot in front of the designed apparatus.

Appendix 2. A sample of the training units

Training Program Schedule – Week Two (Intensity: 80%)

Exercise	Exercise Duration (s)	Repetitions	Rest Between Repetitions (s)	Sets	Rest Between Sets (s)	Total Exercise Time (min)
First Training Unit						
Exercise (7) + Exercise (15)	30	5	60	2	90	14:30
Exercise (8) + Exercise (16)	30	5	60	2	90	14:30
Exercise (9) + Exercise (17)	30	5	60	2	90	14:30
Second Training Unit						
Exercise (1) + Exercise (15)	30	5	60	2	90	14:30
Exercise (2) + Exercise (16)	30	5	60	2	90	14:30
Exercise (3) + Exercise (17)	30	5	60	2	90	14:30
Third Training Unit						
Exercise (10) + Exercise (18)	30	5	60	2	90	14:30

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Exercise (11) + Exercise (19)	30	5	60	2	90	14:30
Exercise (12) + Exercise (20)	30	5	60	2	90	14:30
Fourth Training Unit						
Exercise (9) + Exercise (21)	15	4	60	2	120	10:00
Exercise (10) + Exercise (22)	15	4	60	2	120	10:00
Exercise (11) + Exercise (23)	15	4	60	2	120	10:00
Fifth Training Unit						
Exercise (12) + Exercise (24)	15	4	60	2	120	10:00
Exercise (13) + Exercise (25)	15	4	60	2	120	10:00
Exercise (14) + Exercise (26)	15	4	60	2	120	10:00
Sixth Training Unit						
Exercise (4) + Exercise (26)	15	4	60	2	120	10:00
Exercise (5) + Exercise (27)	15	4	60	2	120	10:00
Exercise (6) + Exercise (28)	15	4	60	2	120	10:00

Note. The training load for Week Two was set at **80% intensity**, with controlled volume and standardized rest intervals to ensure progressive overload and recovery balance.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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The effect of water intake on body composition, weight, BMI, body fat and total body water in obese men

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Abstract

A popular recommendation for weight loss programs is to drink a lot of water. Only a small number of systematic researches have tackled this idea, though. The consequences of consuming an additional 2.25 liters of water per day on the body weight, body mass index (BMI), body fat, and body composition of individuals who were obese were evaluated in this study. The goal is to assess how much water consumption affects an obese person's ability to lose weight and body fat. For 12 weeks, the 100 obese men in this study were told to drink 750 ml of water three times a day, 15 minutes before breakfast. The study used the body analysis system (GS6.5 B. S161118S1544). Body weight, body mass index, and body fat were measured before and after the study. Statistical Analysis to determine the statistical significance of the findings, a paired t-test and IBM SPSS Statistics 27.0 were utilized. The mean body weight, body mass index, body water, body fat, and body composition scores were 93.63 kg, 33.490 kg/m2, 47.33 percentages, 33.519 percentages, and 51.240 percentages respectively, before and after the study. From a statistical perspective, all the parameters' results were quite significant except body weight, which was not significant. In conclusion, the effect of water-intake in obese participants' weight reduction is established by a decrease in body weight, body mass index, body fat, and body composition scores at the conclusion of the study period.

Keywords: obese, body composition, body weight, body fat, body mass index.

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https://jcope.uobaghdad.edu.iq

Introduction

Water function in maintaining health is still not fully understood the importance of water for survival is well known: without water, a person could only survive 2–4 days water makes up about 60% of the human body weight (Michael T. McDermott, 2013, and De Palma, J.R, 2001) and is essential for vital functions Nevertheless, many questions remain unanswered whether consuming water is superior to consuming other liquids or what the exact effect of replacing water with other liquids (e g various high-calorie or diet drinks) in the diet is there is increasing agreement that consuming calorie-dense beverages does not reduce dietary intake, and further research is needed on the effects of choosing beverages other than water at meals on energy intake and body weight (DiMeglio DP Mattes RD, 2000, and Wolf A Bray GA Popkin BM, 2008). Obesity is a major public health problem affecting both adults and children worldwide (Vij VA, Joshi AS, 2014) in both developed and developing countries obesity increases the risk of developing osteoarthritis, heart disease, type 2 diabetes, and some malignancies, among others it also induces physical stress on various biological processes (Ali, Diyar Muhammed, 2025 and Aronne LJ, Isoldi KK, 2007) There is a national obesity epidemic in the United States As a result, nearly 1 in 4 children between the ages of 2 and 5 is overweight or obese Unfortunately, even some of the youngest children are affected drinking can significantly increase a preschooler's calorie intake (Wang YC, Bleich SN, Gortmaker SL, 2008) The Centers for Disease Control and Prevention (CDC) says they may need more water than the average person What kind of water you drink will depend on where you live Hot, humid, or dry climates mean you'll need more water If you live in mountain or alpine regions, you will also need more water (Viscor G, Corominas J, Carceller A, 2023) On the other hand, tap water is an inexpensive, calorie-free beverage Providing tap water to children instead of sugary drinks or excess juices can reduce added sugar and calories (Wang YC, Ludwig DS, Sonneville K, Gortmaker SL, 2009) Fluoridated tap water not only prevents tooth decay, but also helps keep a child's developing body hydrated (Featherstone JD, 1999) Recent studies have shown that drinking water increases thermogenesis, or metabolism, and creates a sympathetic nervous response that increases daily energy intake (Boschmann M, et al, 2003).Therefore, the purpose of this study was to determine whether water intake actually results in weight loss.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Methodology

100 male participants took part in the study; the study took 12 weeks to complete. The subjects gave their written, informed consent. They received an explanation of the aim and rationale of the study, this research was conducted at a tertiary care Jihan clinic in Garmain, Iraq.

Inclusion criteria: The research involved obese young men aged 18 to 26 with a BMI of 30 to 34.9 kg/m2.

Criteria for exclusion: Subjects were required to be free from major illnesses, eating disorders, and medications.

The study parameters

Body weight score, body mass index (BMI) and body composition were measured before the study and compared with the values after the study. Body mass index (BMI) is the cornerstone of today's classification system, and its benefits have been widely used in a variety of purposes, from global screening to individual patient assessment (Prentice AM, Jebb SA, 2001). For the physical structure (body composition), we used the body analysis of GS6.5 B. S161118S1544.

Procedure of the Study

Before starting the research, the weights and heights of the 100 male participants were measured and documented. Body Analyzer G6 calculated body mass index (BMI) and body composition. After the initial readings, participants were instructed to increase their water intake by an additional 2.25 liters, in addition to what they normally drink in a day. This rise in water intake was accomplished by consuming 750 ml of water 15 minutes prior to every meal. The participants were closely monitored while they raised their water consumption before breakfast and lunch and were advised on the amount they needed to increase before dinner. At the end of the 12-week period, the study's parameters were reassessed. The participants typically adhered to the instructions effectively.

Analysis of statistics

A professional statistician performed the statistical analysis of the data from the current study. IBM SPSS Statistics was utilized for data analysis. Statistical significance at a p-value of 0.05 was utilized for all tests by IBM Co. in Armonk, NY, USA. As the research was interventional, a paired t-test was employed to determine the statistical significance of the findings. A p-value below 0.05 showed statistically significant results, while a p-value under 0.01 indicated highly significant results.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Results

Body weight: The mean value for the pre-study body weight for all participants was 93.63 kg and that for post-study body weight was 89.5 kg. The p-value was higher than 0.01, the result for body weight was not significant statistically (Table 1). Body water: The body water result was likewise statistically significant, with mean pre and post-test values of 47.33 and 51.41 percentage points, respectively, and a p-value of less than 0.01 (Table 2). Body mass index (BMI): The average BMI before the study was 33.49 kg/m^2, whereas after the study it was 32.546 kg/m^2. The p-value of less than 0.01 showed that the body mass index findings were also statistically significant (Table 3). Mean body composition score before the study was 51.24mm, compared to 56,321 mm after the study. The p-value was below 0.01, suggesting that the body composition score was also statistically significant (Table 4). Body fat: The mean body fat for pre-test was 33.519 percentages, compared to post-test 32.719 percentages. The p-value was below 0.01, suggesting that the body fat percentage was also statistically significant (Table 4).

Table 1. *Pre and post–study body weight*

Parameter	**Paired samples statistics**						**Paired samples test**			
Body weight (kg)	Pre-test weight			Post-test weight			Paired differences		*t*-value	*p*-value
	Mean	SD	SEM	Mean	SD	SEM	Mean	SD	5.764	1.830
	93.63	2.223	0.115	89.5	3.142	0.564	2.065	0.919		

* ($p > 0.01$) (no significant statistically)

Table 2. *Pre and post–study body water*

Parameter	**Paired samples statistics**						**Paired samples test**			
Body water (percentage)	Pre-test weight			Post-test weight			Paired differences		*t*-value	*p*-value
	Mean	SD	SEM	Mean	SD	SEM	Mean	SD	1.734	0.03

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

	47.33	1.543	0.435	51,41	2.054	0.578	4.08	0.511

* ($p < 0.03$) (highly significant statistically)

Table 3. *Pre and post–study BMI*

Parameter	**Paired samples statistics**						**Paired samples test**			
BMI (kg/m^2)	Pre-test weight			Post-test weight			Paired differences		*t*-value	*p*-value
	Mean	SD	SEM	Mean	SD	SEM	Mean	SD	2.100	0.02
	33.490	1.237	0.783	32.546	4.387	1.284	0.944	3.150		

*($p < 0.02$) (highly significant statistically)

Table 4. *Pre and post–study body score*

Parameter	**Paired samples statistics**						**Paired samples test**			
Body score percentage	Pre-test weight			Post-test weight			Paired differences		*t*-value	*p*-value
	Mean	SD	SEM	Mean	SD	SEM	Mean	SD	15.429	0.001
	51.240	5.376	2.054	56.321	8.821	3.916	5.081	3.445		

* ($p < 0.001$) (highly significant statistically)

Table 5. *Pre and post–study body fat*

Parameter	**Paired samples statistics**	**Paired samples test**

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Body fat percentage	Pre-test weight			Post-test weight			Paired differences		*t*-value	*p*-value
	Mean	SD	SEM	Mean	SD	SEM	Mean	SD	11.073	0.000*
	33.519	2.182	1.825	32.744	1.927	0.862	0.775	0.255		

* ($p < 0.001$) (highly significant statistically)

Discussion

The inadequate quality of previous research on this topic led to the conduct of this study, which evaluated the contribution effect of high-water intake to weight loss. We took into consideration the findings of the current investigation and the corresponding hypothesis because no prior studies had been conducted. For 12 weeks, 100 men participated in this study. A p-value of less than 0.05 showed significant results, while a p-value of less than 0.01 indicated very significant results. The study's data were statistically examined using the paired t-test. The average of body composition, weight, body water, body fat, were 65.86 kg and 64.42 kg, 26.7002 kg/m2 and 26.1224 kg/m2, and 79.626 mm and 76.578 mm, respectively, for the pre- and post-study periods. From a statistical perspective, all three results were extremely significant. The Journal of Clinical Endocrinology and Metabolism published research in 2003 that tested the theory that "the sympathetic stimulus that was provided by water drinking could increase the metabolic rate". This study's unique discovery was that 750 ml of water raised both men's and women's metabolic rates by 30%. Within ten minutes of finishing, there was an increase in metabolic rate, which peaked thirty to forty minutes after consuming water. The effect persisted for over sixty minutes. Based on these measurements, it was estimated that increasing water ingestion by 1.5 liters, over and above the normal water intake, would augment daily energy expenditure by approximately 200 KJ. Over one year, energy expenditure would increase by 73,000 KJ (17,400 Kcal), which is the energy content of 2.4 kg adipose tissue (Boschmann M, et al 2003). This study was designed to check whether this Water-intake translated into actual weight loss. Then we find the effect persisted for over fifteen minutes. Based on these measurements, it was estimated that increasing water ingestion by 2.25 liters, over and above the normal water intake, would augment daily energy expenditure by approximately 197 cal. Over one year, energy expenditure would increase by (71,905 Kcal), which is the energy content of 1.0325 kg adipose tissue. In 2011, comparable research was conducted on obese children to assess the impact of water consumption on their resting energy expenditure (REE). This research showed a rise of

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

25% in REE. After consuming 10 ml of cold water per kilogram of body weight, overweight children continued drinking for more than 40 minutes (Dubnov-Raz G, Constantini NW, Yariv H, Nice S, Shapira N, 2011). Water is crucial for converting stored fat into energy during metabolism and even mild dehydration can slow down the body's metabolism (Blanc, S., et al., 1998). The slower your metabolism, the slower your weight loss will be (Shapses, S.A. and Sukumar, D., 2012.). In order to assess this aspect, the study included measuring the skin fold thickness at certain locations as part of the body composition score evaluation. The total of each separate score was considered as a combined score. Therefore, consuming water stimulates the sympathetic nervous system, leading to an increased metabolic rate known as thermogenesis, which ultimately boosts daily energy expenditure. It is not yet known how water drinking triggers a sympathetic response. Maybe the increase in sympathetic activity from drinking water is triggered by the osmotic properties of water. A 2005 study conducted in Germany and published in the journal 'Neurology' examined the potential mechanism behind the sympathetic response to water consumption (Lipp A, Tank J, Franke G, Arnold G, Luft FC, Jordan J. 2005).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Conclusions

Obesity poses a major danger to people's health. In this current research, the effect of drinking water on weight loss in obese men was investigated. Consuming sufficient water can help lower body weight. At the conclusion of the experiment, the obese participants' weight and BMI decreased, and their body composition changed as water percentages increased, confirming the impact of water intake on their weight loss. Thus, if more study supports this, this minimal intervention may be a useful supplementary treatment for obese individuals who want to increase their energy expenditure.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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Volume 38 – Issue (1) – 2026 Open Access
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The effect of an educational approach based on Schmidt's Schema Theory on learning some basic tennis skills

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Abstract

The research seeks to develop an educational curriculum based on Schmidt's Schema Theory for acquiring fundamental tennis skills, implement this curriculum, and assess its impact on the learning of these skills. The researchers employed the experimental technique by configuring the experimental and control groups to align with the nature of the issue. The research sample comprised tennis players aged 11 to 13 years, categorized into a primary experimental group of 20 players, alongside a control group and an experimental group system. The control group comprised 10 participants, and the experimental group also consisted of 10 participants. The exploratory experiment group consisted of three participants, while three players were removed for lack of commitment. The investigators ran a pilot study on 8 July 2025, with three participants. Subsequently, the research sample was given pre-tests in two days (the first day on October 7th, 2025) by using a serve skill test and for backhand driving skills. The main experiment was carried out for a period of 8 weeks, with three lessons per week. Subsequently, the post-tests were administered, using identical methods regarding timing, location, instruments utilized, and the preparation of all conditions surrounding the pre-tests, to mitigate variables that could influence the post-test outcomes. Subsequently, the results were statistically analyzed, tabulated, and scientifically examined, culminating in conclusions and recommendations.
Keywords : educational approach, schmidt's theory, motor learning, tennis.

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Journal of Physical Education
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Introduction

Motor learning is considered one of the fundamental topics in physical education and movement sciences, as it focuses on studying the processes related to acquiring, developing, and retaining motor skills thru practice and experience. It is viewed as an internal, indirect process that cannot be directly observed, but is inferred thru the individual's observable performance. Motor learning aims to understand how the learner transitions from the stage of imperfect performance to automatic and proficient performance, thru multiple stages including: the cognitive stage, the associative stage, and then the autonomous stage. It also focuses on the role of practice and feedback in improving performance and equipping the learner with the ability to adapt to environmental changes and different situations, which makes it fundamental in the preparation of educational and training curricula in various activities and sports. (Al-Samhi, 2015, p. 22).

Schmidt's Schema Theory is considered one of the most prominent explanatory models in the field of motor learning. It was introduced by Richard Schmidt in 1975 to explain how motor programs are formed and how motor performance is organized in changing situations. This model is based on the idea that an individual does not store separate motor responses for each situation, but rather forms general schemas that are recalled and adjusted according to environmental variables, allowing for flexibility in motor performance and effective transfer of learning to new situations. Studies have proven that variable practice is fundamental in enhancing these schemas, which makes the theory highly valuable in teaching open skills, such as those characterized by tennis, where the speed, direction, and angles of the ball constantly change. (Schmidt, 2011, p.393)

Motor learning is one of the theoretical supports in physical education and sports sciences which attempts to explain how human movements are learned, developed, and maintained through practice and experience. Motor learning is considered a continual process shaped by biological, cognitive and instructional elements through which the mover passes through several stages involving: cognition and perception; to practice and consolidation; towards automaticity (skilful performance). In sport, skill-learning and training programs that are based on scientific principles to promote the learning of specific motor skills. They have assumed special significance because we know that in games like tennis, with open skills, the player must adjust himself to changes of play conditions (direction, speed, height and angle of ball-bounce). More specifically, as of here based on the principles of motor learning that underpins educational programs in which there is a progression from simple to complex tasks and used varied practice and feedback, we can contribute with improving the serve and forehand and backhand strokes among junior players. It develops their capability to play effectively under real playing conditions, and this is reflected positively in the technical skills and competitive levels (Al-Hadidi 2010:61).

The skills of tennis are considered open motor skills that require the player to quickly adapt to constantly changing situations such as the direction, speed, and angle of the ball's bounce. This makes the process of teaching and developing these skills in young players a complex issue if traditional training methods are relied upon, which focus on fixed repetition of the skill without varying the practice conditions. Many studies in the field of motor learning have indicated that using educational programs

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

based on varied practice contributes to the formation of general motor patterns in players, enhancing their ability to perform correctly in new situations and transferring learning from the training environment to actual competition. However, the reality of training in many clubs and centers shows a heavy reliance on traditional methods for teaching basic skills (serving, forehand, backhand), which leads to slow skill acquisition and poor performance under playing pressure. From here, the research problem emerges in the need to prepare and implement an educational program according to Schmidt's Schema Theory to verify its impact on developing some basic skills of junior tennis players and compare it with the traditional method used.

Research Objectives

1. Preparing an educational curriculum according to Schmidt's Schema Theory model in learning some basic skills in tennis. Preparing an educational curriculum according to Schmidt's Schema Theory model in learning some basic skills in tennis.
2. Implementing an educational curriculum according to Schmidt's Schema Theory model in learning some basic skills in tennis. Applying an educational curriculum according to Schmidt's Schema Theory model in learning some basic skills in tennis.
3. Recognizing the impact of the educational curriculum according to Schmidt's Schema Theory model in learning some basic skills in tennis. Identifying the impact of the educational curriculum according to Schmidt's Schema Theory model in learning some basic skills in tennis.

Research Hypotheses

1. There are statistically significant differences between the pre-test and post-test results of the control group in some basic skills (serve, forehand, backhand) in tennis. There are statistically significant differences between the pre-test and post-test results of the control group in some basic skills (serve, forehand, backhand) in tennis.
2. There are statistically significant differences between the pre-test and post-test results for the experimental group in favor of the post-test in some basic skills (serve, forehand, backhand) in tennis. There are statistically significant differences between the pre-test and post-test results for the experimental group, favoring the post-test in some basic skills (serve, forehand, backhand) in tennis.
3. There are statistically significant differences between the post-test results of the two groups (experimental and control) in favor of the experimental group in some basic skills (serve, forehand, backhand) in tennis. There are statistically significant differences between the post-test results of the two groups (experimental and control), favoring the experimental group in some basic skills (serve, forehand, backhand) in tennis.

Research Areas

1. Human field: Junior players aged 11-13 years. Human field: Youth players aged 11-13 years.
2. The spatial domain: Al-Jadriya fields / College of Physical Education and Sports Sciences. Spatial domain: Al-Jadriya fields / College of Physical Education and Sports Sciences.
3. Time frame: 3/6/2025 to 25/9/2025

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Definition of Terms

Schmidt's Schema Theory: It is a model in motor learning that explains that the learner does not store separate movements, but rather forms general motor programs that develop thru varied practice, helping them adapt to new situations and transfer learning (Schmidt, 2011, p.394).

Methodology

The nature of the problem determines the researcher in choosing the appropriate methodology for this problem (Raheem, Shaker, 2025, p14). Therefore, the researchers used the experimental method with the design of the experimental and control groups to suit the nature of the problem.

Research Sample

The research sample was determined from tennis players aged (11-13) years, and the research sample was divided into: the main experimental sample consisting of (20) players, using the control and experimental group system. The number of the control group was (10), and the number of the experimental group was (10) as well. The number of the pilot experiment group was (3) players, and (3) players were excluded for non-compliance. Table (1) shows the distribution of the research sample.

Table 1. *Distribution of the Research Sample*

No.	Description	Number
1	Experimental Group	10
2	Control Group	10
3	Pilot Study Group	3
4	Excluded Subjects	3
Total		**26**

Table 2. *Homogeneity of the Sample in Terms of Height, Weight, and Age*

Variables	Unit	Mean	SD	Skewness
Weight	kg	53.385	4.548	0.367
Height	cm	155.850	2.513	0.881
Age	years	12.532	5.833	0.431

Devices and Tools

The following devices, tools, and information collection methods were used: a Dell laptop, tennis rackets and balls, measuring tapes, a Sony camera, a tennis court, a Casio stopwatch, a Dolphin whistle, cones, hurdles, Arabic sources and references, tests and measurements, and the internet.

The tests used

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

1. Tennis Serve Accuracy Test: (Al-Badri, 2002, p. 153)
Objective: To measure the player's ability to accurately direct the serve toward specific areas in the service box.
Procedure: The player stands behind the service line and performs 10 service attempts to the designated box, and the number of successful attempts within the target is counted.
Scoring: Each successful attempt within the target = one point.
2. Forehand Accuracy Test (Al-Sharqawi, 2010, p. 211)
Objective: To measure the accuracy of the forehand performance toward a specific target in the opponent's half of the court.
Procedure: (10) balls are sent from the coach toward the player, and the player performs a forehand shot toward a target (1.5 × 1.5 m square) specified in the middle of the opponent's half.
Scoring: Ball inside the target = one point, outside the target = zero.

3. Backhand Accuracy Test (Hussein, 2008, p.198)
Objective: To measure the player's ability to accurately direct the backhand shot toward a specific target.
Procedure: The player performs (10) attempts of the backhand stroke after the coach passes the balls, and is asked to direct the ball to a target (a specific area) in the opponent's half of the court.
Scoring: The ball that lands inside the target = one point, and outside the target = zero points.

The Pilot Study

The pilot study is considered "a practical training for the researcher to personally identify the difficulties encountered during the test in order to avoid them in the future" (Al-Shouk and Al-Kubaisi, 2004, p. 91). Therefore, the researcher conducted a pilot experiment on (8/7/2025) on a sample of (3) players. Thru this experiment, the researcher was able to:
1. Knowing the validity of the tests used in the research. Knowing the validity of the tests used in the research.
2. Knowing the problems and obstacles that the sample may face during the application of the tests. Knowing the problems and obstacles that the sample may face during the application of the tests.
3. Identifying the validity of the devices and tools used in the test. Identifying the validity of the devices and tools used in the test.
4. The duration of time taken to perform each test. The duration of time taken to complete each test.

Pre-tests

The researchers conducted the pre-tests for the research sample over two days, on (10/7/2025), by applying the basic skills tests (serving, forehand, backhand).

Table 3. *Means, Standard Deviations, Calculated t-Values, and Statistical Significance of the Pre-Test (Equivalence) for the Experimental and Control Groups*

Variables	Unit	Group	Mean	SD	*t*-value	Sig. Value	Result

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Serve	Score	Control Experimental	4.000 3.900	0.816 0.233	0.287	0.777	Non sig
Forehand Stroke	Score	Control Experimental	3.400 3.500	0.516 0.527	0.429	0.673	Non sig
Backhand Stroke	Score	Control Experimental	3.400 3.700	0.516 0.483	1.342	0.196	Non sig

The main experiment

The educational and training program was prepared according to Schmidt's theory of motor schemas, on (12/7/2025), and extended over eight weeks with three sessions per week, each lasting (60) minutes. It aimed to develop the basic skills in tennis (serve, forehand, backhand) among the research sample of beginner juniors. The program included progressive stages from simple to complex, where the first two weeks (1–2) were dedicated to basic movement education and providing players with the correct initial form of performance thru serve exercises to nearby target squares using various stances, forehand drills after one bounce from the coach at different angles, and backhand wall drills using various balls (hard and soft) to develop initial control. As for weeks (3–4), moderate variation was introduced in practice by reducing the targets for serves and increasing the accuracy of direction, varying the heights and angles of the ball in forehand and backhand strokes, and involving players in short exchanges with teammates within half the court. As the weeks progressed (5–6), the level of variety and complexity was increased by changing the type of ball used during serves and alternating the distribution of balls to different areas of the court. Additionally, directed constraints were imposed, such as playing with one or two touches in forehands and backhands, and changing standing positions near or far from the net to expand the players' motor experiences. During the last two weeks (7–8), participants played small-sided games through quick half-court matches or playing with a scoring zone worth double points. The rules of the game were modified to promote rapid decisions and develop motor flexibility. The sessions also featured activities, students hadn't done before, to assess 'transfer of learning' such as returning balls from odd forcing angles. The sequence for each training was equal consisting of general and specific warm up (10 min), continuous part centred on the three skills to be developed (35–40 min) depending on the exercises we intended to perform at each stage. This was followed by a short directed play (10 minutes) that connected the exercises with actual game situations, ending with a cool-down and quick review (5 minutes). In this way, the program ensured a logical progression from basic education to high variability, reaching real game situations, which aligns with the principles of Schmidt's theory in forming motor schemas and developing the ability to adapt to situational changes in tennis.

Post-tests

After completing the main experiment, the post-tests for the research sample were conducted on (15/9/2025) to achieve accurate results, as "one of the most important ways to determine quality is to conduct tests to ensure the validity of the training program" (Lazem, 2005, p.156). The same procedures in terms of time, place, and tools used were adopted, and all conditions surrounding the pre-tests were prepared to avoid variables that could affect the results of the post-tests.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Statistical methods

The researcher used the Statistical Package for the Social Sciences (SPSS):

- Arithmetic mean.
- Standard deviation.
- Skewness coefficient.
- Cronbach's alpha.
- T-Test formula for independent samples.

Results

Table 4. ***Means, Standard Deviations, Calculated t-Values, and Statistical Significance of the Pre- and Post-Tests for the Control Group***

Variables	Unit	Test	Mean	SD	*t*-value	Sig. Value	Result
Serve	Score	Pre-test	4.000	0.816	7.586	0.000	sig
		Post-test	5.000	0.900			
Forehand Stroke	Score	Pre-test	3.400	0.516	9.633	0.000	sig
		Post-test	4.500	0.600			
Backhand Stroke	Score	Pre-test	3.400	0.516	11.677	0.000	sig
		Post-test	4.600	0.600			

Note. Results are statistically significant at $p < 0.05$ with 11 degrees of freedom.

Table 5. *Means, Standard Deviations, Calculated* ***t****-Values, and Statistical Significance of the Pre- and Post-Tests for the Experimental Group*

Variables	Unit	Test	Mean	SD	t-value	Sig. Value	Result
Serve	Score	Pre-test	3.900	0.233	9.336	0.000	sig
		Post-test	7.900	0.737			
Forehand Stroke	Score	Pre-test	3.500	0.527	11.243	0.000	sig
		Post-test	7.500	0.750			
Backhand Stroke	Score	Pre-test	3.700	0.483	12.659	0.000	sig
		Post-test	7.700	0.483			

Note. Results are statistically significant at $p < 0.05$ with 11 degrees of freedom.

Table 6. ***Means, Standard Deviations, Calculated t-Values, and Statistical Significance of the Post-Test Comparisons Between the Experimental and Control Groups***

Variables	Unit	Test	Mean	SD	t-value	Sig. Value	Result
Serve	Score	Control	5.000	0.816	8.333	0.000	sig
		Experimental	7.900	0.737			
Forehand Stroke	Score	Control	4.400	0.516	13.286	0.000	sig
		Experimental	7.500	0.750			
Backhand Stroke	Score	Control	4.400	0.516	14.758	0.000	sig
		Experimental	7.700	0.483			

Note. Results are statistically significant at $p < 0.05$ with 18 degrees of freedom.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Discussion

The research results showed significant differences between the pre-test and post-test measurements for the experimental group in all basic skills (serving, forehand, backhand), favoring the post-test measurement, indicating the effectiveness of the educational curriculum based on the Schmidt model of motor schemas in improving the performance of junior players. This improvement is attributed to the adoption of varied practice that focused on changing performance conditions (ball angle, speed, standing position, type of ball), which contributed to the formation of general motor patterns in the players, allowing them greater flexibility in performance and a higher ability to adapt to game variables. This result aligns with what Al-Samie and Al-Sheikh (2015) indicated, that varied practice is fundamental for acquiring open skills because it provides multiple opportunities to experiment with and develop responses (Al-Samie, 2015, p. 85).

The results also showed that the improvement in the control group was limited and non-significant in some cases, which can be attributed to the reliance on the traditional method (fixed repetition of attempts under the same conditions) that may give the player a preliminary form of the skill but does not provide the necessary flexibility to handle changing situations in tennis. This aligns with what Al-Hadidi (2010) mentioned, that relying solely on fixed repetition in skill teaching leads to slow learning and difficulty in transferring performance to real game situations (Al-Hadidi, 2010, p. 61).

When comparing the two groups in the post-test, significant differences were found in favor of the experimental group, which reflects the strength of the program based on the Schmidt theory, as the method of practice variability increased the players' accuracy and consistency in performance. This result is consistent with what Al-Shartawi (2010) explained, that educational programs based on modern motor learning principles contribute to improving performance quality and increasing the ability to adapt to changes in the educational and training environment (Al-Shartawi, 2010, p. 211). Therefore, it can be said that the application of the educational curriculum according to the Schmidt model has effectively contributed to improving the players' results significantly in the post-tests, whether compared to the pre-measurements or the control group, which confirms the importance of introducing modern educational programs based on diverse practice in teaching and training the basic skills of tennis.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Conclusions

1. The educational curriculum based on the Schmid model of motor patterns has shown high effectiveness in developing some basic skills (serving, forehand, backhand) among junior tennis players.
2. The differences were significant and in favor of the post-measurements in the experimental group, indicating that varied practice contributes to the formation of general motor patterns that enhance the accuracy and consistency of performance.
3. The control group limited to the traditional method (fixed repetition) showed only limited and non-significant improvement in some skills, confirming the limited effectiveness of traditional methods in developing open skills.
4. The comparison between the two groups after the experiment showed a clear superiority of the experimental group, which reflects the importance of modern educational programs based on the principles of motor learning.
5. The research confirms that developing tennis skills requires the introduction of innovative educational strategies that keep pace with the nature of the open skills characteristic of this game.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

1. The necessity of adopting educational programs based on diverse practices when training and teaching young tennis players instead of relying solely on traditional repetition.
2. Incorporating the Schmidtt model of motor patterns into physical education and sports science curricula as a practical framework for teaching open skills.
3. Preparing similar programs to develop other skills in racket sports (badminton, squash) to verify the generality and effectiveness of this approach.
4. Encouraging coaches to use standardized practical tests to periodically monitor players' progress (serve – forehand – backhand).
5. Conduct future research on larger samples and different age groups to ensure the consistency of the results and expand their applicability in the sports field.
6. Focusing on training coaches to apply modern motor learning strategies and incorporating them into training plans for youth.

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https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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The Effect of Contrast Training on the Development of Muscular Power and Selected Physiological Indicators in Advanced Basketball Players

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Abstract

The purpose of this study was to investigate the effect of contrast training on the development of muscular power and selected physiological indicators in advanced basketball players. An experimental design with two equivalent groups was employed. The sample consisted of twelve players from Al-Difa'a Al-Jawi Basketball Club, who were randomly assigned into an experimental group (n = 6) and a control group (n = 6). The experimental group followed a contrast training program for eight weeks, with three training sessions per week, while the control group continued their regular training program. The dependent variables included muscular power tests (vertical jump and seated medicine ball throw) and selected physiological indicators (resting heart rate, systolic blood pressure, and heart rate recovery). Pre- and post-tests were conducted for both groups. The results revealed statistically significant improvements in all physical and physiological variables in favor of the experimental group compared with the control group. These findings indicate that contrast training is an effective training method for enhancing muscular power and improving cardiovascular efficiency in advanced basketball players. The study concludes that incorporating contrast training into training programs can significantly contribute to improving physical performance and physiological adaptation. Therefore, it is recommended that coaches and practitioners adopt this training method within modern training programs for competitive basketball players.

Keywords: contrast training, muscular power, physiological indicators, basketball, physical performance.

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Journal of Physical Education
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Introduction

In the last years, strength and conditioning training has been generated an outstanding development in team sports where the physiological capacities such us strength, speed and muscular power play a fundamental role, like basketball. The enhancement of muscle power is thought to be one of the most critical physical determinants for competitive tasks at the highest level which contributes significantly in executing offensive and defensive actions effectively such as; sprinting, explosive change of direction, jump and shoot (Bompa & Buzzichelli, 2019).

Current development in strength training has shifted towards combined approaches of heavy loading with plyometric exercises, which have evident benefits regarding improvement on muscular power and neuromuscular efficiency. One of the modern training methods is contrast training, in which high-intensity resistance exercise is immediately followed by an explosive movement and has been thought to be effective for secondary mechanism involving in enhancing neural activation with improved rapid force production (Cormie, McGuigan & Newton, 2011).

More recent research suggests that contrast training can induce favorable physiological adaptations, such as a greater muscle activation and central nervous system efficiency followed by an improvement motor unit recruitment, cardiorespiratory parameters that are involved in the physical performance and skill of trained individuals (Suchomel et al., 2018). Other research has also demonstrated that this style of training is one of the most effective methods to develop muscular power in advanced athletes because it mimic high-level competition demands (Haff & Nimphius, 2012).

In basketball, muscle power is one of the fundamental contributors to performance, and it is well related to the level at which players execute vertical jump, transition speed, defensive efficacy or shooting accuracy (Santos & Janeira 2011).

Contemporary training philosophies are certainly a pressing need to match the enormous evolution in physical demands required for basketball. Normal training programs are not enough to achieve the physical and physiological changes necessary for high level competition. Of such contemporary modes of training, contrast training emerges as an effective means of integrating maximal strength and explosive exercises into a single unit of work, which may result in optimizing both muscular power production and physiological responses through time-efficient manner (dobbs et al., 2019).

Contrast training method relies on the phenomenon of post-activation potentiation (PAP) which elevates neural system efficiency and facilitates quick motor action, leading to increased explosive force or power peak generation (Seitz & Haff, 2016). Several investigations have shown that this prescription can enhance physical and skill performance in team sports, especially basketball (Freitas et al.

Some recent investigations have also reported that contrast training may help to further enhance specific physiological parameters, which are critical for the ability of players to cope with high amounts of training and consecutive matches (e.g., heart rate, cardiac recovery time, cardiorespiratory efficiency) (Beato et al., 2019).

There is a low number of studies examining the impact of contrast training on high-level basketball players, including both muscle power and physiological variables. This

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

stresses the requirement for a scientific investigation that helps to fill this informational void and offer practical training suggestions.

The significance of the study was based on revealing one of the contemporary methods for training--contrast training and its impact to the development of muscular power, as well as elevation of some physiological indices in advanced basketball players. This will give coaches a scientific ground to be used in contriving better training programs, raise the level of physical and functional performance, increase players' preparedness for competition and too adds positively to enriching the Arabic scientific literature by using a modern applied study in the field of sports training.

While there are world-class sports training techniques being used in other parts of the world, most localised teams continue to train in out-dated ways on a physical level featuring repetitive movements that do not agree with integrating modern strength and explosion training. The latter causes a slower development in muscular power, and physiological parameters in elite players. Second, there is a marked difference in jumping and sprinting, as well as physical endurance among players, which adversely affects on-field performance.

According to this practical observation, the necessity for contrast training, as an effective means of enhancing muscular power and some physiological factors became evident. Therefore, the research problem is translated into the following question:

Does contrast training have a positive effect on developing muscular power and certain physiological indicators among advanced basketball players?

Research Objectives

1. To identify the effect of contrast training on developing muscular power among advanced basketball players.
2. To identify the effect of contrast training on improving certain physiological indicators.
3. To compare the results of the experimental and control groups in the post-test measurement.

Research Hypotheses

1. There are statistically significant differences between the pre- and post-tests of the experimental group in muscular power and certain physiological indicators in favor of the post-test.
2. There are no statistically significant differences between the pre- and post-tests of the experimental group in muscular power and certain physiological indicators.
3. There are statistically significant differences between the experimental and control groups in the post-test in favor of the experimental group.
4. There are no statistically significant differences between the experimental and control groups in the post-test.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Research Scope

1. Human domain: Advanced basketball players of Al-Defaa Al-Jawiya Sports Club.
2. Time domain: From 1/9/2025 to 1/11/2025.
3. Spatial domain: Indoor hall of Al-Defaa Al-Jawiya Sports Club.

Methodology

Study Design

The experimenter applied the experimental approach in equivalence groups design (control and experiment) because of its appropriateness to nature of research problem and its objectives. Such method is believed to be one of the most adequate scientific methodologies for investigating the influence of an independent variable (contrast training) on dependent ones (muscular power and some selected physiological markers).

Research Population and Sample

Research Population

The research population consisted of advanced basketball players of Al-Defaa Al-Jawiya Sports Club for the 2025–2026 sports season, officially registered in the Iraqi Central Basketball Federation records.

Research Sample

The research sample was selected purposively because the researcher works directly with the team. The sample included 12 players who were randomly divided into two equivalent groups:

- Experimental group: 6 players
- Control group: 6 players

Before applying the training program, homogeneity in the dependent study variables for the experimental and control groups was confirmed with pre-tests by means of comparing averages using an independent samples t-test. It was evident from the results that no significant difference in all the tests of observation were obtained (calculated t-value was less than tabular t at df and P <0.05) between the both groups which indicates that the two groups were equivalent and fit for conducting experiment scientifically.

Table 1. *Equivalence of the experimental and control groups in the research variables before implementing the experiment*

Variables	Group	Mean	S.D.	t-value	Sig.	Significance
Vertical Jump	Experimental	47.83	3.12	0.41	0.120	Not sig
	Control	48.50	3.45			
Medicine Ball Throw	Experimental	6.42	0.36	0.47	0.155	Not sig
	Control	6.50	0.41			
Resting Heart Rate	Experimental	71.83	2.64	0.58	0.111	Not sig
	Control	72.50	2.88			
Systolic Blood Pressure	Experimental	118.67	4.32	0.62	0.150	Not sig
	Control	119.83	4.76			
Heart Rate Recovery Time	Experimental	29.50	2.07	0.49	0.130	Not sig
	Control	30.17	2.33			

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Tools and Equipment Used

- Digital medical scale for body weight (kg)
- Stadiometer for height measurement
- Digital stopwatch
- Electronic blood pressure monitor
- Heart rate monitor
- Medicine balls (3 kg)
- Plyometric boxes
- Free weights (barbells & dumbbells)
- Resistance bands
- Measuring tape
- Data recording forms

Tests Used

Muscular Power Tests

1. Vertical Jump Test

The vertical jump test is one of the most common tests in sport for assessment of lower limb muscular power. It stands for the highest an athlete can reach from a standing position during a jump in the vertical plane and characterizes efficiency of force realization by neuromuscular apparatus in the generation of explosive force necessary at faster motor tasks. It is commonly used in team sports, particularly those where vertical jumping ability is needed (e.g.basketball), because of its strong relationship with athletic performance (offensive and defensive) including jump shooting and rebounding.

It is executed by a participant standing next to a wall (even if they are not touching it) while reaching upwards as high as possible and marking the wall at the highest point of the reach. The participant jumps vertically to reach the highest point possible using both legs and arms at the same time, and that height is recorded. The arbitrary number is the difference between a standing reach and reaching at the point of jump. Distance best of three trials is measured in centimeters (cm). The test is highly valid, reliable, and objective and therefore appropriate for physical evaluation in scientific as well as applied research (Sargent, 1921; Harman et al., 1991).

2. Seated Medicine Ball Throw Test (3 kg)

The seated medicine ball throw test assesses upper extremity muscle power, especially in the muscles of the arms, shoulder, and chest. It is related to player's capacity to develop explosive force in a short time which is required as many offensive and defensive basketball manoeuvres, for example long pass and powerful shot or quick ball movement.

The test is conducted while patients are sitting with the legs fully extended forward, and to prevent involvement of the trunk against a wall or any fixed support. The athlete performs an over head throw with a medicine ball from the 4.5 inch position like in this

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

video. Distance X is that distance between the line of fire and the first ground contact of any point. Three attempts are made and the best one is measured in metres (m). This test has shown good criterion-referenced validity for the assessment of upper-limb muscle power and is commonly used to measure explosive strength in team sports (Stockbrugger & Haennel, 2001; Mayhew et al., 2005).

Physiological Indicators

1. Resting Heart Rate

RHR is a primary physiological measure that represents cardiovascular fitness and physical adaptation in athletes. A lower resting HR implies an enhanced cardiac-pumping efficiency and stroke volume, thereby decreasing myocardial work during exercise. It is commonly used to monitor training status, cardiorespiratory fitness, and recovery and adaptation to the training load.

Resting HR was determined after the player remained for 10 min in a comfortable position, without performing any physical activity and talking. Heartbeats were monitored for at least 1 minute with a heart-rate monitor (in beats/minute (bpm)). Recent researches have revealed that RHR is an accurate tool to assess cardiac adaptations due to different training programs, especially strength and power (Buchheit & Laursen, 2013; Kenney et al., 2020).

2. Blood Pressure (Systolic and Diastolic)

Blood pressure is an essential vital sign that indicates the circulatory and cardiovascular system performance. Systolic pressure is the force generated during systole (contraction of the heart) and diastolic pressure created by vascular resistance during diastole (relaxation of the heart). It is commonly used in sports science to determine the impact of exercise programs on cardiovascular health and function.

Blood pressure was collected using an approved medical grade electronic equipment, after the player had been at ease and seated for a minimum of 10 min with his arm at heart level to avoid incorrect readings. Both systolic and diastolic pressures were measured in millimeters of mercury (mmHg). Studies show that consistent training, specifically contrast training, is associated with improved blood pressure control and favorable cardiovascular profile which result in physical performance gains simultaneously yielding health benefits (Cornelissen & Smart, 2013; Pescatello et al., 2019).

3. Heart Rate Recovery (HRR)

Recovery heart rate after exercise is a novel physiological marker of parasympathetic activity and the capacity of the body to recover rapidly from intense physical effort. It is calculated as the difference between heart rate directly after standard exercise and that 1 minute later. If it decreases quickly, it means you have a very high cardio and respiratory efficiency."

HRR was assessed after a standardized physical exercise in all participants. The heart rate was measured immediately after stopping the test, and then one minute afterward; the difference between these 2 measurements was considered as heart-rate recovery. This marker has been reported as one of the strongest predictors of

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

cardiorespiratory fitness and training load tolerance, being strongly correlated with high athletic performance (especially in team sports) (Buchheit & Gindre, 2006; Peçanha et al., 2017).

Pilot Study

A pilot study was conducted on two players outside the main sample to:

- Verify the suitability of tools and equipment
- Determine the appropriate time required to perform the tests
- Identify potential implementation difficulties
- Train the assisting team on measurement procedures

The pilot study helped avoid errors and achieve greater measurement accuracy.

Training Program

A contrast training protocol, to promote muscle power and enhance some physical capacities, was developed for elite basketball players. The duration of the program was 8 weeks, three times per week and each session lasted 90 min. The program was developed based on current scientific strength and power training concepts, including the principles of progressive overload, movement specificity to basketball skills, and work-to-rest balance.

The approach was to combine high-intensity resistance exercises (80–90% of 1RM) with mechanically similar plyometric activities in relation to force direction and movement pattern, without any rest between them. Such a method was used in an attempt to take advantage of post-activation potentiation (PAP) which increases neural drive and is thought to facilitate explosive force development. It was not the skill practiced in a distinct portion of the training session, alternating it with a rest period to maintain its performance quality and minimize injury.

Components of the Training Session for the Experimental Group

1. General and Specific Warm-up (15 minutes)

Dynamic warm-up, easy pace running, basketball-specific movement drills and neuromuscular stimulus drills to prepare the muscular and nervous systems for peak performance and minimize injury risk.

2. Main Part (65 minutes)

Included the implementation of contrast training exercises according to the following format:

High-intensity resistance exercise (80–90% 1RM) followed immediately by a mechanically similar plyometric exercise.

Three to five sets of each pair of exercises were executed, with 3–5 and repetitions for resistance and plyometric exercise, respectively. Times between sets varied from 2 to 4 minutes.

3. Cool-down (10 minutes)

Included static stretching, breathing exercises, and muscular relaxation techniques to accelerate recovery and reduce muscular tension after physical exertion.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 2. *Weekly distribution of training sessions during the program period (8 weeks)*

Week	No. of Sessions	Training Days	Session Duration (min)	Load Intensity	Training Type
1	3	Sat – Mon – Wed	90	80% 1RM	Contrast
2	3	Sat – Mon – Wed	90	80% 1RM	Contrast
3	3	Sat – Mon – Wed	90	85% 1RM	Contrast
4	3	Sat – Mon – Wed	90	85% 1RM	Contrast
5	3	Sat – Mon – Wed	90	90% 1RM	Contrast
6	3	Sat – Mon – Wed	90	90% 1RM	Contrast
7	3	Sat – Mon – Wed	90	85% 1RM	Contrast
8	3	Sat – Mon – Wed	90	80% 1RM	Contrast

Note: Total number of training sessions = 24.

Meanwhile, the control group continued performing the traditional training program adopted by the team coach.

Statistical Analysis

Data were statistically processed using SPSS (v26) through the following methods:

- Mean
- Standard deviation
- Paired samples t-test
- Independent samples t-test
- Percentage of improvement (%)

A significance level of (0.05) was adopted.

Results

Table 3. *Results of the Paired Samples t-test Between Pre- and Post-Tests for the Experimental Group*

Variables	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t-value	Sig.	Significance Level
Vertical Jump	47.83 ± 3.12	55.67 ± 3.08	6.42	0.001	Significant
Medicine Ball Throw	6.42 ± 0.36	7.25 ± 0.41	5.87	0.002	Significant
Resting Heart Rate	71.83 ± 2.64	66.17 ± 2.48	5.11	0.003	Significant
Systolic Blood Pressure	118.67 ± 4.32	112.33 ± 3.97	4.96	0.004	Significant
Heart Rate Recovery Time	29.50 ± 2.07	21.83 ± 1.94	6.75	0.001	Significant

Table 4. *Results of the Paired Samples t-test Between Pre- and Post-Tests for the Control Group*

Variables	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t-value	Sig.	Significance Level
Vertical Jump	48.50 ± 3.45	50.17 ± 3.38	1.88	0.118	Not significant
Medicine Ball Throw	6.50 ± 0.41	6.78 ± 0.39	1.65	0.160	Not significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Resting Heart Rate	72.50 ± 2.88	70.83 ± 2.71	1.94	0.109	Not significant
Systolic Blood Pressure	119.83 ± 4.76	117.67 ± 4.29	1.72	0.142	Not significant
Heart Rate Recovery Time	30.17 ± 2.33	27.83 ± 2.25	1.83	0.125	Not significant

Table 5. *Comparison Between the Experimental and Control Groups in the Post-Test Using the Independent Samples t-test*

Variables	Experimental (Mean ± SD)	Control (Mean ± SD)	t-value	Sig.	Significance Level
Vertical Jump	55.67 ± 3.08	50.17 ± 3.38	2.97	0.015	Significant
Medicine Ball Throw	7.25 ± 0.41	6.78 ± 0.39	2.81	0.019	Significant
Resting Heart Rate	66.17 ± 2.48	70.83 ± 2.71	3.02	0.013	Significant
Systolic Blood Pressure	112.33 ± 3.97	117.67 ± 4.29	2.63	0.025	Significant
Heart Rate Recovery Time	21.83 ± 1.94	27.83 ± 2.25	4.21	0.002	Significant

Table 6. *Percentage of Improvement for the Experimental and Control Groups*

Variables	Experimental (%)	Control (%)
Vertical Jump	16.38%	3.44%
Medicine Ball Throw	12.93%	4.31%
Resting Heart Rate	7.87% ↓	2.30% ↓
Systolic Blood Pressure	5.34% ↓	1.80% ↓
Heart Rate Recovery Time	26.03% ↓	7.74% ↓

Discussion

Purpose The main purpose of this study was to determine the influence of contrast training on muscular power, as well as few selected physiological indicators among advanced basketball players. Results showed statistically significant differences in almost all variables between the experimental and control groups, demonstrating the effectiveness of this train-asympt approach in evoking beneficial changes at a physical and functional level.

The experimental group's performance results (the following variables: vertical jump and medicine ball throw) had significant improved mean score in muscular power, while the control group showed a non-significant development in muscular power. These results could be related to the characteristics of contrast training when high loads and plyometric exercises that are mechanically similar (acting on the same muscle groups) are combined, with post-activation potentiation (PAP mechanism) involved. This leads to greater motor unit activation and muscle contraction velocity, ultimately resulting in improved explosiveness.

These findings are similar to those described by Dobbs et al. (2019) and Tillin & Bishop (2009), which reported that contrast training is one of the most effective means of

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

promoting muscular power performance in trained individuals as a result its influences being on neuromuscular efficacy, as well as rate of force development over short-term. Loturco et al. (2017) further highlighted that this method is especially appropriate for jumping and acceleration sports like basketball, introducing motor adaptations in accordance with the demands of competitive performance.

The advantage of the experimental group compared to the control group in posttests is also due to the fact that program of study used exercises which are similar to real patterns of motion, as well as training specificity. Suchomel, Nimphius and Stone (2016) substantiated the significant benefits of exercise type to sport-specific demands compatibility for enhancing training.

The findings of the present study also indicated a statistically significant reduction in physiological measures for the intervention group in terms of resting heart rate, systolic blood pressure and heart rate recovery (the duration to decrease from peak HR post exercise to 120bpm). No significant changes were observed among control subjects. This enhancement is indicative of beneficial changes in cardiovascular efficiency and parasympathetic regulation.

This enhancement may be related to the characteristics of contrast training (combined acute heavy resistance exercise with fast explosive movements) that resulted in better excreting function, including enhanced cardiac function and pump efficiency for blood as well as altered neural balance between sympathetic and parasympathetic tone. This can lead to a quicker recovery from strenuous activities. Plews et al. (2013) demonstrated that both high-intensity and intermittent training results in significant improvements of some HR recovery indices, which are a marker of trained cardiorespiratory fitness.

Another interesting fact is that the reduction in recovery time following exercise is a good expression for cardiac efficiency and for adjustment of athletes to contemporary training loads (Seiler, Haugen & Kuffel 2007). Michael, Graham, and Davis (2017) demonstrated that the integration of strength training with plyometric work results in significant physiological adaptations which manifest in lower resting heart rate with a greater cardiac response during exercise.

Results of the post-test comparison revealed obvious differences between the experimental and control group in favour of the former for all variables, that do not seem due only to regular training, but rather probably ascribable to the specificity of contrast method applied. This is consistent with the data of Cormie, McGuigan and Newton (2011) who also showed that performing maximal strength exercises in combination with explosive training (combined effect) is more effective than single mode traditional training.

These results are also in line with Beato and Dello Iacono [14], where the authors showed physical characteristics of team sport athletes improved to a greater extent following combined strength training approaches compared to traditional programs,

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

because of increased neuromuscular stimulation and participation in more favorable physiological adaptations.

Improvement rates clearly favored the experimental group in all variables, indicating that the training program was effective. This shows that contrast training has an effect not only in performance enhancement and muscular power development but also in physiological adaptations, which can translate into maximize competition performance through better capacity for high-intensity efforts, and ability of players to tolerate the demands on competitive activities.

These results corroborate the conclusions of Turner et al. (2015), who claim that high rates of improvement from complex training program are an evident sign for the good design of the training, and also efficient realization of it.

Conclusions

1. The results indicate that contrast training is highly effective in improving muscular power of lower and upper limbs of advanced basketball players
2. The training intervention resulted in enhancements of some critical physiological parameters including resting HR, SBP and HRR time.
3. The experimental group was significantly better than the control group on all physical and physiological measures at posttest.
4. It seems, that the typical contrast training was effective in inducing positive neuromuscular adaptations indicated by increased rate of force development.
5. The players benefited well from the training program in terms of improvement of cardiovascular system effectiveness.
6. The current researches verified the necessity of using modern training methods as well, instead of traditional ones in basketball domain.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

1. Implement contrast training on elite basketball players in their team setting.
2. During the specific preparation and competition periods, small doses of contrast training should be included because it provokes a positive effect on physical performance.
3. Physiological measurements used in this study should be applied on a regular basis to evaluate the progress of players' physical condition.
4. Performing comparable studies for other age categories, like beginners and juniors.
5. Develop further studies investigating changes in skiing kinematics, kinetics and psychology after contrast training.
6. Develop training programs that combine contrast training with other contemporary training methods for maximal training adaptations.
7. Use the results of this investigation, as a practical way for workout programs to be established by basketball coaches working in Iraqi clubs.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Journal of Physical Education
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The Impact of a Psychological Guidance Program on Reducing Role Conflict Among First-Degree Referees Participating in The Iraqi Stars League in Football

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Abstract

The first-class referees officiating the Iraqi Stars League are confronted with a variety of functions they execute during one refereeing season. Referee perform different tasks apart from opposing robots such as Main Referee, Assistant Referee, Fourth Official and Social and Professional Activities. Role conflict in this case may arise from the divergent and highly abstract expec-tations fostered by different role set members. With the incredible technical and competitive progress experienced by Iraqi Stars League and an increase in the amount of first-class referees' pressure, there arises a pressing necessity to create scientifically based counseling programs that reduces role conflict among referees and develops their cognitive-behavioral capacities. This, in its turn, can be good for refereeing and decision-making on the field. Role conflict is considered one the psychological problems that can lead to increased anxiety, distraction and difficulty in making decisions, which have a harmful effect on referring level of performance. This research aims at indicating the effect of a counseling program as a mean of decreasing role conflict for first class referee in concrete situations in Iraq Star League (football). The study reached to the conclusion that counselling programmed had a positive and significant impact in lowering down the role conflict level of referees. The programmer also enhanced their psychological and professional adaption on duty performance in refereeing. Therefore, it is suggested to incorporate counseling program in the preparatory and development programs implemented by the Iraqi Football Association.

Keywords: Counseling program, Role conflict, First-class referees, Football, Iraqi Stars League, Sports psychological counseling.

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Journal of Physical Education
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Introduction

The dynamic of psychological behavior and cognitive demands needed for certain types of sports may differ from one sport to another, the nature of rules in each particular sport, type of interaction among participants and pressure throughout performance.

Football is one of the most complex sports in terms of psychological demands, given its speed, diversity of official situations and large number of pressing variables that referees face when running a match. The level of importance on public and media exposure is also considerable, particularly at the higher levels of competition such as Iraqi Premier League matches, which adds even more pressure on referees' state of mind.

The referee is regarded as one of the fundamental pillars of all sports activities, especially in football. Their role extends beyond merely enforcing the rules; it encompasses managing emotional situations, regulating player and coaching staff behavior, and making critical decisions in brief moments under high psychological pressure. Achieving an ideal level of officiating performance is not a trivial matter, as it necessitates precise cognitive knowledge of the law, behavioral and emotional competencies, and high psychological capabilities that enable the referee to cope with competitive pressures and make sound decisions at the appropriate time (Hani, 2019).

Psychologists are interested in investigating the reasons that underlie human performance. A well-known model of human needs, Abraham Maslow's hierarchy, is characterized by five levels: physiological (food and shelter), safety/security (protection from danger), social (belonging to a group) and self-esteem, before finalising in 'self-actualization'. The psychological need for safety is one of the strongest drivers of behavior. According to Erikson, failure to reach this level of security results in performance disturbances and an inability to take on a positive orientation toward self-fulfillment, which negatively influences the quality of decision-making under stress (Khalil Star Mohammed, 2019).

Role conflict is one of the psychological and social processes influencing referees' performance, which is a natural custom for human beings in social life. People may simultaneously be in more than one such role, sometimes resulting in role conflict or overlap. In the not-too-distant domain of officiating, role conflict is especially obvious for football match officials working simultaneously at various levels within one season (e.g., centre referee, fourth official, assistant referee and VAR).

The role of conflict characterizes the degree of psychological tension and stress that the referee feels in plying his trade, which may reach a level by which they interfere with the ability to concentrate, make proper decisions and perform efficiently during the game. If these pressures do not subside and the science community does not organize to intervene, they may undermine referee confidence, evaluation, or retention.

The psychological and cognitive dimension of officiating has risen in prominence, thus support programmes have become one of the modern scientific methods to help people understand themselves, deal with their pressures, and take a positive approach towards internal and external conflicts. Cognitive-behavioral counseling programs are the most effective means of changing our irrational ideas, acquiring cognitive and behavior skills as well as having to cope with. the requirements of a high-pressured situation (Ahmed Dhari Hani, 2019).

Football is one of sports that requires psychological readiness which enables the players to take control over their feelings and to adjust themselves within the circumstances and mental status (Hani, Khudhair, & Jasim, 2022).

Based on the remarkable technical and competitive progress witnessed by the Iraqi Premier League, as well as the increasing levels of pressure experienced by first division referees, it became very important to put in place that scientific guidance programs contribute to alleviate role conflict among them, and develop some cognitive and behavior abilities which lead to a positive reflection on their performance during refereeing matches and quality of decisions.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The objective to apply guidance program in order to cut role conflict for the first division referees, (In Iraq Premier League) by raising their cognitive and behavioral capabilities, Reflect the pressure from some of psychological aspect and complete decision taking. It aims to provide the scientific base upon which referee training programs can be created and officiating standards in Iraq can be enhanced, and referees' psychological stability during games ensured. It is also aimed at increasing the reliability and standard of officiating within Iraq for local competitions, and will guide development programs for referees across all levels in future.

Officials at high (football) levels, such as the Iraqi Premier League, experience mounting psychological and occupational pressure due to improved playing standards, increased pace of play, complex officiating and public influence in media. Officials are critical for match success and equity since precision in law enforcement and decision-making is crucial (Dhahi, Hani, & Khudhair, 2022).

First division referees participating in the Iraqi Premier League experience a multiplicity of roles during a single officiating season, transitioning between different roles such as center referee, assistant referee, and fourth official, which may lead to a state of conflict or overlap among these roles, known as role conflict. Role conflict is a psychological issue that may contribute to increased tension, decreased concentration, and diminished decision-making ability, negatively impacting officiating performance.

Despite the growing interest in developing the physical, technical, and legal aspects of referees through officiating courses, the psychological and cognitive guidance aspect still receives limited attention, and there are, to the best of the researcher's knowledge, no systematic guidance programs targeting the reduction of role conflict among football referees in Iraq, particularly first division referees participating in the Iraqi Premier League.

Guidance programs aim to foster new attitudes in individuals characterized by flexibility and adaptability through the use of diverse methods that equip individuals with skills, concepts, information, attitudes, and values that assist them in changing and modifying their behavior (Hani, 2021).

Moreover, the focus on football referees stems from their essential role in the game and their contribution to its enjoyment, the safety of players, and the achievement of fairness. Stakeholders in football have taken an interest in monitoring, analyzing, and studying referees' behavior to qualify them according to precise and comprehensive scientific curricula, preparing them adequately to match their status in leading the game and ensuring its smooth conduct with the least possible errors, while managing and overcoming pressures and controlling their psychological emotions that affect their decisions and rapid mental and physical responses (Khalil Star Mohammed, 2019).

Thus, the research problem is defined by the following question:

Does the implementation of the guidance program have an effect on reducing role conflict among first division referees participating in the Iraqi Premier League?

The research aims to:

- Develop a guidance program to reduce role conflict among first division referees participating in the Iraqi Premier League.
- Identify the impact of the guidance program on reducing role conflict among first division referees participating in the Iraqi Premier League.

The research also hypothesizes that there are statistically significant differences between the pre-test and post-test measurements in the level of role conflict among first division referees participating in the Iraqi Premier League, in favor of the post-test measurement.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Methodology

The method is the right scientific way in which a researcher goes to achieve his objective which he sets at the dining table when of the study. The researcher has to chose a method that fulfils his purpose (Radi, Hani and Khudhair 2025). So that, the experimental method used in this research is considered to be appropriate for solving the problem of the research and selected one group designs with pre-test - post test. The population of the study is all the referees of Iraqi Stars League in (2025-2026), their number is (80). The researcher chose a sample of the same population and that was Baghdad Governorate with the aim to reduce variables and to have more accessibility, The sampling group included (23) referral agents for guidance program, which form the proportion (28.75%) of the study population. It is also remarkable that the scientific foundations were built for referees in other governorates, including (40) referees that represent (50%) of population and number of selected referees who participated in pilot experiment reached (5), and Alt: Population percent was (6.25%). Therefore, the total sample size is (68) referees representing %(85), as shown in Table (1).

Table 1. *Details of the Research Sample and Their Percentage Distribution*

No.	Sample Type	Number	Percentage of Sample	Percentage of Population	Total Population
1	Pilot sample	5	7.35%	6.25%	
2	Main application sample	23	33.82%	28.75%	80 referees
3	Total sample	68	100%	85%	

Devices, tools, and means for data collection

- References and Arabic sources.
- The World Wide Web (Internet).
- Role Conflict Scale Appendix (1).
- Guidance Program Appendix (2).

Role Conflict Scale (Muslim, 2024, p. 108)

The researcher utilized the Role Conflict Scale developed by Ali Kazem Muslim, which comprises 43 items distributed across six domains: 7 statements for the first domain, 8 statements for the second domain, 6 statements for the third domain, 7 statements for the fourth domain, 7 statements for the fifth domain, and 8 statements for the sixth domain. The scoring is conducted using a correction key consisting of five alternatives: (Always, Often, Sometimes, Rarely, Never), with weights assigned as follows: (5-4-3-2-1). The highest score attainable by the respondent is 215, while the lowest score is 43. The hypothetical mean of the scale is 129; thus, a score equal to or exceeding the hypothetical mean indicates a prevalence of role conflict among the referees. Refer to Appendix (1).

Pilot Study

To ascertain the appropriateness of the scale for the sample level, as well as to determine the time required for its application and to identify potential obstacles that may be encountered in both pre-test and post-test measurements (And Ahmed Dhari Hani, 2019), a pilot study was conducted on September 5, 2025, involving a sample of 5 referees in the smart hall at the College of Physical Education and Sports Sciences, University of Baghdad. This study confirmed the scale's suitability for the sample.

Main Study of Scientific Foundations

A second, independent group expert in sports psychology field, reviewed the test to verify that all items were suitable scoring 100%. Then, 40 referees were assessed using the scale to find discriminative ability, internal consistency and split-half reliability. All items were found to be

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

discriminatively valid and highly consistent. In addition, the reliability of the scale was high, making it available for use in the major study.

Main Study

Pre-Test Measurement

The pre-test measurement was conducted on the research sample, consisting of 23 referees, on October 16, 2025, at 3:00 PM.

Guidance Program Coupled with Exercises

The investigator established an orientation program employing a lecture-discussion method and a group counseling process. The method used in this study nurtures personal qualities through engagement, managing discussion, sharing views and adjusting with group members to narrate situations of role conflict and normative / behavioral orientations as revealed by the researcher. The majority of participants, especially the new third-dans, were encouraged by the counselor to participate in order for them to mix well with others.

It is essential to clarify several points regarding the guidance program:

- Target Audience: First Division referees participating in the Iraqi Stars League.
- Program Duration: 8 to 10 weeks (one session per week).
- Number of Sessions: 10 guidance sessions.
- Duration of Each Session: 60 to 75 minutes.
- Program Approach: Group Counseling.
- Adopted Counseling Methodology: Cognitive-Behavioral Counseling, Sports Psychological Counseling, Psychological Skills Training.
- General Objectives of the Program: The main aims of the programme were to lower role conflict in football (soccer) referees, improve psychological and professional adaptability when managing games, promote mental strengths linked with refereeing performances and increase efficiency in coping with pressure situations.
- Each guidance session includes multiple discussions, video presentations, images, and illustrative tools such as data shows and other resources; see Appendix (2).

Post-Measurement

Following the pre-measurement procedures, the researcher also conducted a post-measurement on 23 referees at 9:00 in the morning of December 6, 2025 and testing was concluded by noon.

Statistical Methods

The researcher utilized the Statistical Package for the Social Sciences (SPSS) to analyze the research results and to ascertain the differences between the pre-test and post-test measurements.

Results

Table 2. *Descriptive Statistical Data for the Role Conflict Scale (Pre-Test)*

Statistical Indicators	Value
Mean	133.2609
Median	133.0000
Standard Deviation	6.21741
Skewness	0.4250
Standard Error of Skewness	0.4810
Minimum	124.00
Maximum	146.00

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

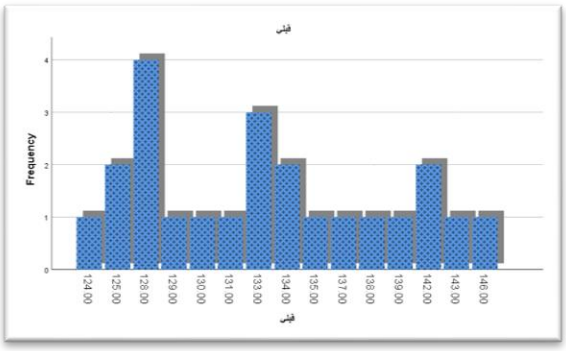

Figure 1. *Illustrates The Frequency Distribution of Role Conflict (Pre-Test)*

Table 3. *Role Conflict Score and t-value Between the Arithmetic Mean and the Hypothetical Mean for the Application Sample in the Pre-Test*

Statistical Procedures	Variable	Unit	Hypothetical Mean	Arithmetic Mean	Mean Difference	Calculated t-value	Significance Level (p)	Significance
Pre-test	Role conflict	Score	129	133.2609	4.26087	3.287	0.003	Significant

Note: The result is considered statistically significant when $p < 0.05$ at 22 degrees of freedom.

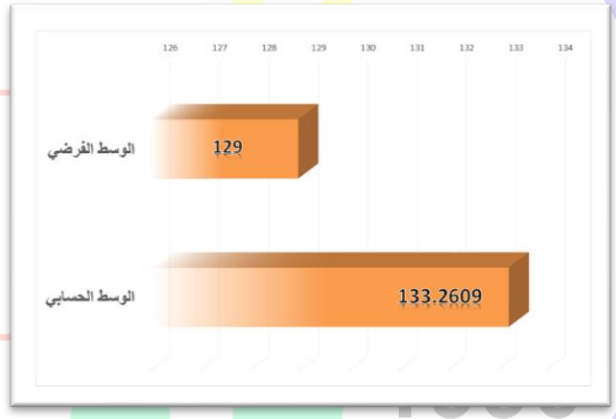

Figure 2. *Illustrates A Comparison Between the Hypothetical Mean and The Arithmetic Mean of The Pre-Test Psychological Measurements*

Table 4. *Descriptive Statistical Data for the Role Conflict Scale (Post-Test)*

Statistical Indicators	Value
Mean	92.5652
Median	91.0000
Standard Deviation	7.55481
Skewness	−0.323
Standard Error of Skewness	0.4810
Minimum	75.00
Maximum	107.00

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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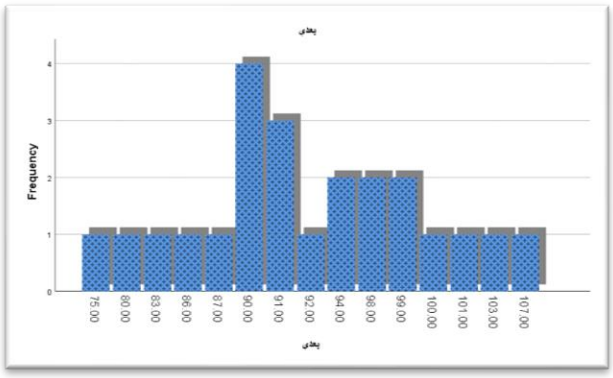

Figure 3. *Illustrates the Frequency Distribution of Role Conflict (Pre-Test)*

Table 5. *Role Conflict Score and t-value Between the Arithmetic Mean and the Hypothetical Mean for the Application Sample in the Post-Test*

Statistical Procedures	Variable	Unit	Hypothetical Mean	Arithmetic Mean	Mean Difference	Calculated t-value	Significance Level (p)	Significance
Post-test	Role conflict	Score	129	92.5652	−36.43478	−23.129	0.000	Significant

Note: The result is considered statistically significant when $p < 0.05$ at 22 degrees of freedom.

Figure 4. *Illustrates a Comparison Between the Hypothetical Mean and the Arithmetic Mean for The Post-Measurement Psychological Assessment*

Table 6. *Differences in Means, Standard Deviations, and t-value Between Pre- and Post-Measurements of Role Conflict Among Referees*

Statistical Procedures	Variable	Unit	Mean Difference	SD of Differences	Standard Error	Calculated t-value	Significance Level (p)	Significance
Pre–post comparison	Role conflict	Score	40.69565	9.22662	1.92388	21.153	0.000	Significant

Note: The result is considered statistically significant when $p < 0.05$ at 14 degrees of freedom.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Figure 5. *Illustrates the Difference Between Pre-Measurement and Post-Measurement in Role Conflict*

Discussion

The outcomes of the study revealed that first-tier referees in suffer from relatively high levels of role conflict, as shown by a mean (133.2609) on the basis test, exceeding its hypothetical mean (129). P-values were less than (0.05), so, the differences are statistically significant and in favor of estimated mean. This discovery is a negative signal that clearly affects the player´s in-game performance. Competing demands associated with role conflict can negatively influence referees‟ concentration, mental preparation and emotional control and readiness for competition which results in reduced performance when both physical and technical elements are concerned.

While VRAs may suffer lesser degrees of cognitive load, as VAR taking technology becomes more commonly used by referees, there is likely to be an increase in arousal during the critical decision-making period. One of the psychological effects that one of its technologies could modify is a psychic drop (psychological hesitation) which is a state of doubt and indecision that could prey on the referee during a decision-making process, due to fear based in the consequences it will generate with respect to video-attribution possibilities. Dependence on VAR technology has the potential to undermine the confidence of a referee in their immediate judgment call, due to its likely waiting for the assistance or correction from video room (Thare Hani, Talib Abd and Saad Ibrahim 2025). This may be seen from Figure (2).

Under the influence of pressing circumstances, features of each profession and features that are existing in training endowed individuals with a certain ideology that is distinctive to them on reality and work in different situations including ways of thinking (Afifi & Al-Hanaini, 2002, p. 22). Conflict is "the process which begins when one party has frustrated the ability of another to achieve a goal, or in other words, first put an obstacle into the way of another. It also refers to the state of contention / dispute / disagreement between parties in a relationship, or could be explained as that sense of frustration with being pulled in two opposite directions at the same time (Qasimi, 2013, p.7).

The researcher believes that in any sport, the one umpire or referee seeks to be the best and distinguished over all others and so there is competition among them. This rivalry can cover harmful consequences where intolerance, based on the ambition to achieve sources of power and material and moral privileges, as well as an injured "I" lead a person into rejecting the principle of fair competition. The situation is further aggravated due to the inability of the organizational structure to effectively handle the administration, the mismatch in instructions and feelings, bad relationships. A an individual's preference for conflict over co-operation mainly guides players.

On the basis of these results, it was clear that an intervention was needed to reduce combative conflict. Therefore, the proposal to create and apply a guidance program for this purpose was born, which through reducing role conflict of the referees would improve their psychological and physical equilibrium, with positive repercussions on sports performance and competition level. Psychological readiness is one of the basic needs in football game which provides capability to player to execute their physical, motor and abilities with best performance (Hani et al., 2022).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Study results show that first-class referees in the Iraqi Stars League having high levels of role conflict scored differently on this variable. The average score on pretest (92.56529) is also less than the assumed mean (129). The p value was also less than (0.05), meaning that the differences were statistically significant and in favor of the mean score. Such discovery is a good indication for the direct effect on their field performance in real matches. High levels of role conflict negatively impact the ability of referees and this is consistent with our expectation as well as it relates to their emotional competence and mental preparation in competitive contexts. By extension, this might result in decrement of both the technical and physical match performance as shown on Figure (4).

This reduction in stress suggests that the programmer did not just alleviate the visible symptoms of role conflict but also helped to manage effectively coping strategies themselves when facing psychological pressures due to competition within a cohesive team environment. In addition, this finding highlights the need to consider both psychological and physical components within training, especially during competitive periods when maintaining high levels of attention and psychological balance is crucial for optimal performance.

The study results revealed significant differences between the pre-test and post-test scores in averse of post test on the level of role conflict among first-degree referees involved in Iraqi Stars Football League. This indicates that the guidance program seems to have been successful in decreasing this behavior.

This enhancement is led to the content of the guidance program, which concentrated on defining the referee role, limits and responsibilities; as well as enhancing referees' self-concept with dealing with psychological pressures and emotional situations intra and/or off field. The guidance sessions also helped the referees to restructure their self-perceptions as official and to separate them from those related with social or personal role, leading this fact to their psychological cohesion during match management.

Guidance programmers are intended to cultivate new attitudes in people by applying a variety of ways that will provide them with skills, concepts, information, attitudes as well as values that enable them to modify and change their behavior (Hani 2021). In addition, the program was instrumental in developing communication skills and emotional control, and improved decision-making under pressure, decreasing tension/confusion prompted by divergent expectations from different stakeholders (player/coach/spectator/media). These results are in line with several studies of sports psychology that have also supported the programs of assistance decrease psychological conflicts and enhance professional adjustment in referees.It is also interesting that the reduction of role conflict after participating in the programmer was a mirror image of an enhancement in self-confidence and psychological equilibrium, which are necessary for success of a referee to control demanding matches (for example, Iraqi Stars' League).

Once the results of pre-test were analyzed, it was clear to that in this sensitive competitive phase, and as is usual in role conflict occurred at a relatively high level considering these pressures [that are] exposed to referee, starting from both team and some pressures related on part his players even audience requirements, intensity of competition and fears [for them from failure or injury], but also some pressure of being subverted by following playback referee own personal performance. This attitude negatively affects the focus, decision-making and emotional management of play, conditioning the technical and physiological performance of referees.

In contrast, post-program implementation results indicated a clear reduction in role conflict indicators, suggesting that the program effectively achieved its objectives. This reduction can be attributed to a range of interrelated factors associated with the guidance program.

Therefore, the results indicate that following cognitive and behavioral moves of the guidance package program, there is a significant reduction in role conflict among referees. All of these lead to a success that increases self-confidence and releases the referee from all the situations other than on-field match officiating. The diversity of referees' roles can generate considerable stress and

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

anxiety, particularly when performance expectations rise and responsibilities/roles grow concomitantly. This is because the psychological environment referees encounter is frequently different from that of their peers and on occasion can be negative and contribute to self-image development as well as augmenting internal conflict.

In light of the above, it is important to note the association between programme involvement and role conflict. The guidance program assists in the alleviation of role conflict by:

- Clarifying the refereeing role and minimizing psychological distraction.
- Enhancing confidence and mental resilience.
- Improving decision-making ability under pressure.
- Increasing the psychological and social adjustment level of the referee.

Conclusions

1. First division referees in the Iraqi Stars League have different degrees of role conflict before applying the program guidance.
2. The effects of the guidance program are beneficial and successful in decreasing role conflict for referees.
3. The program has enhanced the psychological and occupational profile of referees in their role as on-field-umpires.
4. Explanation tendency of role setting and psychological enlightening ability can ease the stress and lower negative emotion.
5. Guidance may be considered an effective approach in the psychological preparation of referees, complementing physical and technical training.
6. It has contributed to increase players' capacity of psychological pressure handling; and to higher levels of concentration and emotional control during matches at a competitive level.

Recommendations

1. The Iraqi Football Association Decoration on the guidance program within the referees' training and development programs.
2. The psychological assistance must be included in the official referee schools of all categories.
3. The psychological control on the part of referees, especially in high stress cup games and at certain matches.
4. Conducting such studies on referees at other levels or in different sports.
5. The creation of specific guidance interventions focused on other psychological aspects, i.e., anxiety, burnout, and competitive stress in referees.
6. The article suggests training referees and assistant referees in the principles of psychological support and stress prevention so that they can more effectively handle pressure from both players and crowds.
7. The research highlights the need for collaborative work between sports psychologist and coaching staff to support the integration of psychological and technical elements in player development.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Appendices

Appendix (1)

No.	Item	Always Applies	Often Applies	Sometimes Applies	Rarely Applies	Never Applies
1	I pay the same level of attention to my duties as a linesman as I do as a VAR referee.					
2	I maintain the same high level of concentration in youth and senior matches.					
3	Despite my experience, I continuously review the laws of the game.					
4	I strive to participate in courses and lectures related to refereeing laws.					
5	I neglect to ensure that all refereeing equipment is available before matches.					
6	I always arrive on time before matches.					
7	I commit to early attendance regardless of the competition level.					
8	I encourage my fellow referees throughout tournaments.					
9	I build relationships with referees who tend to be socially withdrawn.					
10	I support my fellow referees even when they are uncooperative.					
11	I invite my colleagues to attend officiating development courses.					
12	I accept criticism appropriately regarding refereeing decisions.					
13	I find it difficult to establish friendships within the refereeing environment.					
14	All referees prefer to work with me during matches.					
15	I enjoy assisting colleagues in reviewing the laws of the game.					
16	Emotional players affect my match leadership style.					
17	I feel disturbed when my decision is overturned by the VAR referee.					
18	Crowd pressure and provocation do not alter my decisions.					
19	I can improvise effectively during fast refereeing situations.					
20	I have the confidence and ability to officiate difficult and important matches.					
21	I lose control during matches when faced with difficult situations.					
22	I fear conflicts among players during decisive matches may affect my performance.					

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

23	I am influenced by crowd criticism while officiating.
24	I avoid officiating matches involving players who frequently cause trouble.
25	I feel anxious about others' perceptions when I make a refereeing mistake.
26	I doubt my ability to continue officiating when my decision is challenged by the main referee.
27	I have the ability to turn failure into success.
28	I experience physical discomfort before matches assigned to me.
29	I feel unsuccessful when I hear about another referee's success.
30	My hands often tremble during intense matches.
31	I experience physical discomfort before officiating.
32	I use exaggerated gestures or words to attract attention during matches.
33	I imitate the behavior of elite international referees.
34	My performance is not affected by audience criticism or insults.
35	A poor evaluation motivates me to improve future performance.
36	I strive to maintain full concentration throughout every match.
37	I do not mind being a VAR assistant to a referee with less experience.
38	I stay close to the stadium during rest periods in case I am needed.
39	I strictly arrive early for important matches.
40	Long matches negatively affect my personal commitments.
41	I take responsibility for any decision in which I assist the main referee.
42	I feel less responsible when acting as assistant referee than as main referee.
43	I prefer not to work as a main referee due to the heavy responsibility involved.

Appendix (2)
The Counseling Program
Session One: Refereeing Personality (Building Professional Identity)
Procedural Objectives:

1. To enable referees to define their professional self-concept as officials.
2. To distinguish between the refereeing role and other social roles.
3. To recognize the relationship between weak professional identity and role conflict.

Detailed Content:

1. Refereeing personality as a professional psychological construct.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2. Dimensions of refereeing personality (emotional – cognitive – behavioral).
3. How role ambiguity leads to role conflict.

Implementation Steps:

1. Opening the session with the question: *"Who is a successful referee from your perspective?"*
2. Presenting real-life examples of referees with clear professional identity.
3. Distributing a self-assessment test to measure clarity of refereeing identity.
4. Group discussion of the test results.

Activities:

1. Group brainstorming.
2. Professional self-awareness assessment.
3. Writing a personal definition of the refereeing role.

Evaluation Indicators:

1. The referee's ability to clearly express their professional role.
2. Reduction in inconsistency in professional self-perception.

Session Two: Prevention of Psychological Stress

Procedural Objectives:

1. To identify personal sources of stress.
2. To differentiate between facilitating and debilitating stress.
3. To apply preventive strategies before and during matches.

Detailed Content:

1. Internal and external refereeing stressors.
2. Cognitive interpretation of stress (according to Lazarus' theory).
3. Psychological prevention versus psychological treatment.

Implementation Steps:

1. Open discussion about the most stressful situation experienced.
2. Classification of stress sources (personal – environmental – organizational).
3. Practical training on muscular relaxation and breathing techniques.

Activities:

1. Role-playing stressful situations.
2. 4–6 breathing exercise.
3. Homework assignment (daily stress diary).

Evaluation Indicators:

1. Improved early recognition of stress.
2. Reduced exaggerated emotional responses.

Session Three: Fear of Failure

Procedural Objectives:

1. To identify irrational thoughts.
2. To reinterpret refereeing errors realistically.
3. To reduce performance anxiety.

Detailed Content:

1. Concept of failure in sports officiating.
2. Automatic negative thoughts.
3. Cognitive restructuring (Ellis – Beck).

Implementation Steps:

1. Presenting officiating cases involving critical errors.
2. Analyzing the thoughts associated with each situation.
3. Training referees to replace negative thoughts.

Activities:

1. Thought record.
2. Discussion of real cases.
3. Exercise: (thought – feeling – behavior).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Evaluation Indicators:

1. Reduction in negative self-talk.
2. Improved confidence during decision-making.

Session Four: Mental Toughness

Procedural Objectives:

1. To enhance resilience under pressure.
2. To improve attentional control and concentration.

Detailed Content:

1. Concept and dimensions of mental toughness.
2. Cognitive control during matches.
3. Emotional stability in critical moments.

Implementation Steps:

1. Explanation of mental toughness components.
2. Training in selective attention focusing.
3. Simulation of decisive refereeing situations.

Activities:

1. Concentration exercises.
2. Video-based officiating simulations.
3. Rapid decision-making drills.

Evaluation Indicators:

1. Faster response with higher decision accuracy.
2. Reduced mental distraction.

Session Five: Positive Self-Confidence

1. To build realistic confidence based on competence.
2. To reduce emotional instability.

Detailed Content:

1. Sources of refereeing confidence.
2. Difference between positive confidence and false confidence.
3. Positive self-talk.

Activities:

1. Achievement record.
2. Self-talk training.
3. Self-assessment of abilities.

Evaluation Indicators:

1. Stability of performance level.
2. Clarity of decisions without hesitation.

Session Six: Psychological Flexibility

Procedural Objectives:

1. To develop adaptability to sudden changes during matches.
2. To manage errors and controversial decisions without losing emotional balance.
3. To maintain positive performance after negative situations.

Detailed Content:

1. Concept of psychological flexibility in sports.
2. Flexibility as a cognitive–emotional coping mechanism.
3. Difference between negative acceptance and positive acceptance of errors.
4. Rapid psychological recovery strategies after mistakes.

Implementation Steps:

1. Opening question: *"What do you do after a controversial decision against you?"*
2. Presenting refereeing scenarios requiring immediate behavioral change.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

3. Analyzing rigid versus flexible responses.
4. Practical training on refocusing after mistakes.

Activities:
1. Problem-solving tasks.
2. Scenario simulations (wrong decision – crowd pressure – continuation of play).
3. Mental reset exercise.

Evaluation Indicators:
1. Faster recovery of focus after stressful situations.
2. Reduced defensive or justificatory behaviors.

Session Seven: Emotional Stability
Procedural Objectives:
1. To control negative emotions during matches.
2. To prevent emotional interference in decision accuracy.
3. To maintain behavioral balance under provocation.

Detailed Content:
1. Core emotions related to officiating (anger, anxiety, frustration).
2. Relationship between emotion and decision-making.
3. Emotional regulation mechanisms (cognitive – physiological).

Implementation Steps:
1. Discussing cases of emotional outbursts in officiating.
2. Identifying the most common emotional triggers.
3. Practical training on breathing and arousal control techniques.
4. Role-playing provocative situations.

Activities:
1. Deep breathing exercises.
2. Role-playing (protesting player – arguing coach).
3. Emotional counting technique.

Evaluation Indicators:
1. Reduced emotional reaction intensity.
2. Stability of voice tone and body language.

Session Eight: Social Cohesion
Procedural Objectives:
1. To enhance harmony within the officiating team.
2. To improve effective communication during matches.
3. To reduce interpersonal conflicts and misunderstandings.

Detailed Content:
1. Concept of social and functional cohesion.
2. Importance of teamwork in officiating.
3. Communication patterns among referees.
4. Conflict management within the officiating crew.

Implementation Steps:
1. Discussing previous experiences of poor team cohesion.
2. Identifying sources of conflict.
3. Training on non-verbal communication skills.
4. Group trust-building activities.

Activities:
1. Open discussion.
2. Cooperative group activities.
3. Communication drills (signals – eye contact – coordination).

Evaluation Indicators:
1. Improved crew coordination.
2. Reduced tension among referees.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Session Nine: Balanced Responsibility

Procedural Objectives:

1. To foster balanced professional responsibility.
2. To reduce excessive self-blame after mistakes.
3. To enhance objective self-evaluation.

Detailed Content:

1. Concept of professional responsibility in officiating.
2. Difference between responsibility and guilt.
3. Managing media and public criticism.
4. Positive self-reflection.

Implementation Steps:

1. Presenting cases of severe officiating criticism.
2. Analyzing unhealthy reactions.
3. Training on separating the self from the mistake.
4. Guiding referees to establish personal evaluation standards.

Activities:

1. Case analysis.
2. Group counseling.
3. Exercise: *"My strengths and limitations."*

Evaluation Indicators:

1. Reduced rumination after matches.
2. Improved acceptance of feedback.

Session Ten: Utilizing Successful Experiences

Procedural Objectives:

1. To enhance intrinsic motivation.
2. To reduce role conflict through positive experiences.
3. To build a positive psychological outlook toward the refereeing future.

Detailed Content:

1. Recalling successful officiating experiences.
2. The role of success in building professional identity.
3. Transforming achievement into sustained motivation.
4. Psychological planning for the future.

Implementation Steps:

1. Asking referees to narrate successful officiating experiences.
2. Analyzing psychological success factors.
3. Linking success to competence rather than luck.
4. Developing a personal psychological action plan.

Activities:

1. Experience sharing.
2. Writing a future psychological plan.
3. Final group discussion.

Evaluation Indicators:

1. Increased motivation and professional confidence.
2. Reduced perceived role conflict.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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The Effect of Tactical Exercises Based on Maximal Aerobic Capacity on Developing Some Physical Abilities and Fast Offensive Transition in Youth Basketball Players

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Abstract

Exclusive drills are acknowledged as good strategies to build physical and tactical condition in players, since they represent gaming situations and are related to the correlation of the physical exercise with training. If these drills are devised for maximum oxygen consumption (VMA), players will be able to exert themselves at or near their competitive intensity and/or work load, which in turn helps develop specific endurance, speed, strength, agility and quick directional change abilities. The research problem arises from the weakness of such capabilities, that are evident in youth players (mainly slow transition between defense and offense, less precision under fatigue). Therefore, tacks were practiced during seven weeks in a group of six junior players with two sessions per week and tests were performed. The investigator's results show that the effectiveness of the training exercises is due to combining physical and tactical elements in a game-type training context, which enables some physical capacities and fast transitions on offense in basketball to be trained. According to these results, the study suggests including tactical games pr eg -specific to maximum aerobic power in youth training programs where intensity and variety of training loads should progressively range from moderate too intense for optimal physical an d technical effectiveness.

Keywords: Tactical drills, aerobic power, fast offensive transition

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https://jcope.uobaghdad.edu.iq

Introduction

Basketball is a collective sport that demands big expression of motor action and in which physical, technical and tactic qualities are integrated. Play is rapid and there are frequent offensive and defensive changes. Given the strong evolution of modern styles of play, we need to pay attention to certain physical capacities capable of conditioning skill and tactical performance, especially power capacities connected with maximal aerobic output, which constitutes the physiological basis for resistance in execution over repeated efforts in a short period. It allows the player to maintain a good level of performance during the match and reduce muscle fatigue due to repeated effort.

Such is the nature of basketball where young players have to change from defense to offense in an instant and should be able to fast break or run set plays on speed and quick judgment and that too with a shot clock counting down. Quick offensive transition in one of the most significant revolutionaries' factors that affects to attacking effectiveness in current teams. Its based on running, pass and shoot as quickly as possible (short clock) to put easy points before the defense get organized.

One of the key ways to improving Tactical and Physical efficiency is by way of tactical drills (they simulate match conditions linking physical performance and the context). If the tactical drills are planned on maximal aerobic speed, they can be used to lead players to a level of effort near their physical maximum capacity therefore increasing specific endurance and speed of performance without affecting skill accuracy under fatigue. The association between tactical drills and maximal aerobic capacity is an additional progress in training, since exercising at such intensities (90-100% of maximal oxygen uptake) generates players with high physiological tolerance to work intensity and increases cardiovascular and respiratory effectiveness. Physical capabilities associated with performance in attack such as speed, strength, special endurance and agility are trained.

Designing such drills helps coaches achieve integration between physical and tactical aspects, as aerobic effort is not separated from the tactical situation within the exercise but is incorporated into a realistic sequence that simulates actual play under conditions close to competition. This type of training can contribute to improving players' functional efficiency and enabling them to make decisions under fatigue, which is a decisive factor in real matches. Hence, the importance of the present study lies in identifying the effect of tactical drills designed according to maximal aerobic capacity on developing certain physical abilities (speed, strength, agility, and specific endurance) as well as improving fast offensive performance among youth basketball players, aiming to prepare players capable of executing fast attacks accurately and effectively even at the end of the match when fatigue reaches its peak.

Basketball is a team sport where combined performance from physical, technical and tactical points of view are needed. The players must have an excellent aerobic and anaerobic capacity to undertake defensive and offensive tasks optimally during the match.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Aerobic fitness is an important factor in the ability of a player to sustain effort, and move rapidly without fatigue from defending moves on principle involved in attack.

Youth stage represents a sensitive period for physical and skills development, due to the rapid growth of physiological and motor systems in this period; therefore, it is the best period for training in activities specific (physical abilities) and new tactical playing patterns. The researcher observed that youth players lacked effective execution of these skills where there was significantly slow transition periods from defensive to offensive play and the accuracy of performance decreased with induced fatigue.

Strategies used for youth players were found to concentrate more on the general physical and technical rather than combine movement through tactics with physiology (aerobic capacity). Consequently, Athletes can execute skills correctly during the early stages of a game but struggle to continue that practice as the physical load increases or game speed progresses. Even if one considers post-work to be important, fast offensive transition auto-dynamic is also relatively weak, which is ironic because it is the single most individual indicator of tactical superiority in modern basketball.

The research problem arose as a result, and the need to develop tactical drills based on maximal aerobic capacity that integrates high physical effort with tactical behavior under conditions simulating real gameplay situations in order to optimize performance was highlighted. The next possible question may arise: The tactical drills designed according to maximal aerobic capacity — do they contribute in developing some physical abilities and fast offensive performance of youth basketball players?

Therefore, the research addresses this question by applying training programs including tactical exercises that rely on maximum aerobic capacity to allow players to maintain good performance in conditions of increasing physical load and speed.

Research Objectives

1. To design tactical drills based on maximal aerobic capacity that suit the requirements of youth basketball players.
2. To identify the effect of tactical drills based on maximal aerobic capacity on developing certain physical abilities (speed, agility, explosive strength, and specific endurance) and fast offensive performance in youth basketball.

Research Hypotheses

1. There are statistically significant differences between the pre- and post-test results of the experimental and control groups in physical abilities (speed, agility, explosive strength, and specific endurance) and fast offensive performance in favor of the post-test.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2. There are statistically significant differences in the post-tests between the experimental and control groups in physical abilities (speed, agility, explosive strength, and specific endurance) and fast offensive performance in favor of one of the groups.

Research Scope
Human Scope: (12) youth basketball players.
Time Scope: From 6/8/2025 to 29/9/2025.
Spatial Scope: Baghdad.

Research Methodology and Field Procedures

Research Method:

The researcher adopted the experimental method due to its suitability to the nature of the research problem and its objectives. It is considered one of the most accurate and objective approaches for studying scientific problems and analyzing them from both theoretical and applied perspectives (Allawi & Ratib, 2000, p. 213).

Population and Sample

The community for the study were purposively selected and sample was collected randomly. It included (12) male youth players from the school team training centers, which belonged to the Directorates of Education and collaborated with Olympic Champion program. A random sample of the Al-Karkh Second Directorate was collected for study. It is worth mentioning that random sampling does not mean surprise or expedient, but rather the result of deliberate planning to attempt to achieve an honest and unbiased representation of the population under study (Allam, 2010, p. 19).

The sample was divided into two similar groups, an experimental group (6) players and a control group (6) players aged 16 years and under. Subjects were effectively representative of the target population and the research aims.

Data Collection, Devices, and Tools Used

1. Observation and experimentation.
2. Interviews.
3. Tests and measurements.
4. Computer.
5. Measuring tape.
6. Whistle.
7. Cones and poles.
8. Stopwatch.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

9. Four basketballs.

Test of the study

1. 30-Meter Sprint Test (Kharibut, 1989, p. 95):
Purpose of the test: To measure maximal transitional speed.
Equipment: Stopwatch and whistle.
Two parallel lines are marked 30 meters apart; the first represents the starting line and the second the finish line.

Performance description:

The participant stands behind the starting line in a high start position. Upon hearing the whistle, the participant sprints at maximum speed until crossing the finish line.

Performance conditions

Multiple players do the test at once to keep it competitive

Recording method

- Each participant gets only one chance.
- The seconds elapsed between the start line and finish line are recorded.
- American Alliance for Health, Physical Education and Recreation approved face validity of the test.

3. **Agility Test (Kharibut, 1989, p. 156)**
Equipment: Five poles and a stopwatch.

Test setup

The testing area is arranged in a cross (+) shape, with each direction 5 meters away from the center.

Procedures
The participant starts from a standing ready position at the center. Upon the start signal, the participant runs toward one pole, turns, and returns to the center, then turns toward the next pole, and continues in the same manner until completing movement in all four directions and reaching the finish line.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Recording

The time is calculated from the start signal until the participant crosses the finish line.

Research Methodology and Field Procedures

Research Method

The researcher adopted the experimental method due to its suitability to the nature of the research problem and its objectives. It is considered one of the most accurate and objective approaches for studying scientific problems and analyzing them from both theoretical and applied perspectives (Allawi & Ratib, 2000, p. 213).

Research Population and Sample

Research Population and Sample this study's population was determined based on the purposive method, while its sample was selected from it using a random method. It included (12) eligible male youth players in academies of school team training centers and working with and coordinating for Olympic Champion program under the cases of Directorates of Education. A random sample for representation of the research sample was selected by randomly selecting the members of the team representing Al-Karkh Second Directorate. Random sampling does not mean spontaneity or improvisation; it is rather founded on systematic planning which seeks to guarantee a realistic and objective representation of the target population (Allam, 2010, p. 19).
The sample was randomly distributed into two equal groups, an experimental group (6) players and a control group (6) players under the age of16. The sample population was consistent with the target research population as per study objectives.

Means of Data Collection, Devices, and Tools Used in the Research

Means of Data Collection

1. Observation and experimentation.
2. Interviews.
3. Tests and measurements.
4. Computer.
5. Measuring tape.
6. Whistle.
7. Cones and poles.
8. Stopwatch.
9. Four basketballs.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Measurement and Tests

1. 30-Meter Sprint Test (Kharibut, 1989, p. 95)

Purpose of the test: To measure maximal transitional speed.
Equipment: Stopwatch and whistle.
Two parallel lines are marked 30 meters apart; the first represents the starting line and the second the finish line.

Performance description

The participant stands behind the starting line in a high start position. Upon hearing the whistle, the participant sprints at maximum speed until crossing the finish line.

Performance conditions

More than one player performs the test simultaneously to ensure a competitive environment.

Recording method

- There is only a single trial for each participant.
- The period it takes from crossing the start line to finishing is measured in seconds.
- Test has face validity endorsed by the American Alliance for Health, Physical Education, and Recreation

2. Agility Test (Kharibut, 1989, p. 156)

Equipment: Five poles and a stopwatch.

Test setup

The testing area is arranged in a cross (+) shape, with each direction 5 meters away from the center.

Procedures

The participant starts from a standing ready position at the center. Upon the start signal, the participant runs toward one pole, turns, and returns to the center, then turns toward the next pole, and continues in the same manner until completing movement in all four directions and reaching the finish line.

Recording

The time is calculated from the start signal until the participant crosses the finish line.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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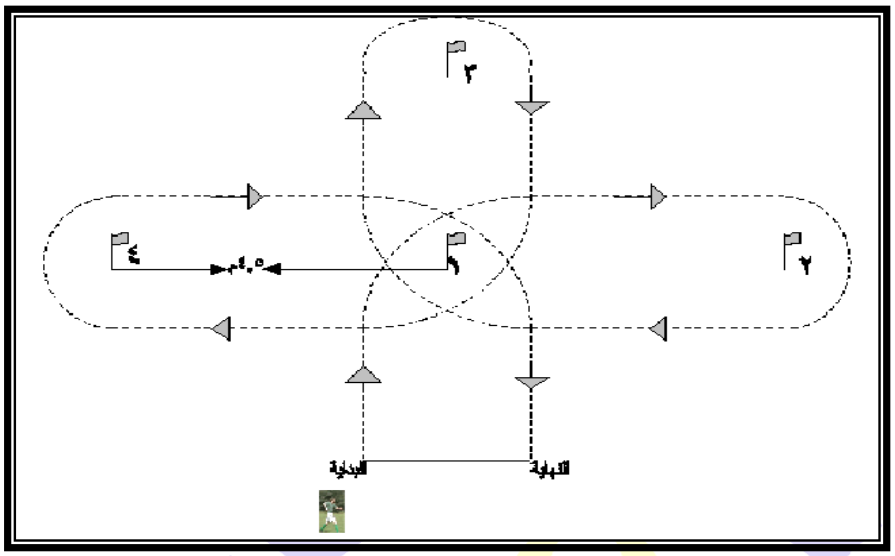

Figure 1. *illustrates the agility test.*

2. Explosive Strength – Vertical Jump Test (Sargent Test) (Allawi, 1994, p. 84):

Purpose of the test: To measure the explosive strength of the leg muscles.

Performance description

The participant stands beside a calibrated board (or fixed measuring tape) after coating the fingertips with a marking substance (such as chalk). The participant raises the marked arm fully to place a finger mark on the board without lifting the heels and without raising the shoulder level of the marked arm above the other shoulder. Then the arm is lowered, and both arms swing forward and backward with a slight knee bend, followed by knee extension to perform a vertical jump to the highest possible point and place a new mark with the marked hand.

The distance between the two marks represents the vertical jumping ability and is measured in centimeters. The participant is given three attempts, and the best attempt is recorded.

3. Basketball Specific Endurance Test (Hoff & Helgerud, 2004, pp. 165–180):

Purpose of the test: To measure specific endurance (skill endurance) associated with actual basketball performance, combining physical effort and technical skills (such as running, changing direction, and shooting).

Equipment used

- Standard basketball court
- Two basketballs

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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- Stopwatch
- Whistle
- Cones to mark distances
- Recording sheet for attempts and points

Test procedures

A T-shaped course is set: 10 m in length with two sides of 5 m each. Five cones are placed in each direction, with 1 m between each cone, for a total running distance of approximately 30 m.

A player is standing behind the starting line with a ball. On signal, the player runs at a moderate speed with the ball to the first cone (10 m) and performs dribbling movements from side to side between the cones and then returning to the start line — first on the right and then back on the left. The player returns and makes two shots at the basket from a distance of 4 m.

The performance continues for 3 continuous minutes, during which the player attempts to complete as many cycles as possible (running + shooting).

Scoring

- One point is awarded for each completed cycle.
- Half a point is awarded for each successful shot.
- Final score = total points accumulated during 3 minutes.

The test is repeated twice, and the best score is recorded.

4.**Fast Break Test in Basketball (Allawi, 2000, p. 243)**

Purpose of the test: To measure the speed and accuracy of fast break execution among basketball players.

Required equipment

- Standard basketball court
- One basketball per player
- Digital stopwatch
- Measuring tape to determine distances
- Recording sheets

Test procedures

The player is on the baseline with the ball in hand. As the start signal is given, the player sprints at full speed towards the opposite basket (around 28 m) The player will then

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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pass it to a wall or teammate at midcourt, get the ball back and run towards the basket for an open lay-up shot right after.

The total time is calculated from the moment of starting until the ball enters the basket. If the shot is unsuccessful, an additional 0.5 seconds is added to the recorded time as a penalty.

Recording method

The best time from three attempts is recorded for each player. Speed is calculated based on the relationship between distance and time, and the shortest time is considered the best indicator of fast offensive performance.

Procedures

Pilot Study

The researcher conducted a pilot study on Wednesday, 6/8/2025, involving two players from outside the main research sample. The purpose was to apply the tests, train the assisting team on implementing the procedures, identify potential difficulties during execution, and determine the necessary equipment and tools required for conducting the experiment and tests.

Pre-tests

The pre-tests were conducted at Martyr Abu Bakr Al-Samarrai Hall in Baghdad Governorate on Saturday, 9/8/2025, at 6:00 p.m.

Normal Distribution of the Sample

Table 1. Normal distribution of the sample in selected research variables

Variables	Unit of Measurement	N	Mean	Median	Standard Deviation	Skewness
30 m Speed	sec	12	4.326	4.32	0.068	0.344
Explosive Strength	cm	12	35.83	36	1.337	0.461
Agility	sec	12	16.114	16.09	0.060	0.655
Specific Endurance	score	12	6.633	6.50	0.519	0.225
Fast Break	sec	12	9.152	9.15	0.118	0.015

It is evident from Table (1) that the skewness values were all within the range of (+3), indicating the homogeneity of the research sample in the variables listed and confirming that they fall within the normal distribution curve.

Equivalence Between the Two Groups

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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One of the requirements of the experimental design for this study was to determine the baseline equivalence between the two research groups in the pre-tests. Therefore, the researcher used the independent samples t-test to identify the equivalence between the experimental and control groups, as shown in Table (2).

Table 2. Equivalence between the two groups in the research variables

Variable	Experimental Group Mean	SD	Control Group Mean	SD	t-value	Error Level	Significance
30 m Speed	4.3167	0.07312	4.3367	0.05046	-0.551	0.593	Not significant
Explosive Strength	36.1667	1.16905	35.5000	1.51658	0.853	0.414	Not significant
Agility	16.1083	0.06080	16.1200	0.06542	-0.320	0.756	Not significant
Specific Endurance	6.8917	0.24103	6.7167	0.54924	0.538	0.603	Not significant
Fast Break	9.1167	0.11690	9.1883	0.11974	-1.049	0.313	Not significant

Main Experiment

The implementation of the training program began on Monday, 11/8/2025, and continued until Thursday, 25/9/2025.

- Duration of the program: (7) weeks.
- Total number of training sessions: (14) sessions.
- Weekly training sessions: (2) sessions.

The intensity of tactical drills was determined based on percentages of maximal aerobic capacity, which represents the highest running speed an athlete can maintain using only the aerobic system before the anaerobic system becomes the primary source of energy production. This indicator is considered one of the most accurate methods for determining aerobic training intensity, as exercises are adjusted according to a percentage of this speed.

The drills were designed to integrate physical effort with rapid tactical thinking in real playing situations. The duration and intensity of effort were regulated according to the type of exercise and the required tactical performance. Training load progression was applied weekly according to the principle of gradual overload while considering youth players' responses to training.

Training intensity was determined through a 2000 m running test. For example, if the completion time is 360 seconds, the speed equals 5.55 m/s. Training at 95% intensity corresponds to approximately 378 seconds (about 5.29 m/s).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Training intensity ranged between 90%–100% of maximal aerobic capacity.
- Weeks (1–2): 90–95% of maximal aerobic capacity to achieve physical and mental adaptation.
- Weeks (3–7): 95–100% to improve cardiovascular and respiratory efficiency and enhance tactical decision-making speed during performance.
- Effective effort time per training session ranged between 15–25 minutes.
- Duration of each effort ranged from 30 seconds to 3 minutes depending on the type of exercise:
    - (30–60 seconds): to develop speed endurance and neuromuscular response during fast breaks.
    - (1–3 minutes): to improve aerobic efficiency and specific endurance for consecutive attacks.

Active rest was used (light running at 50–60%) to maintain a moderate heart rate (140–160 beats/min) and ensure continuous aerobic stimulation. Example: 2 minutes effort / 2 minutes rest or 1.5 minutes rest.

Post-tests

The post-tests were conducted at Martyr Abu Bakr Al-Samarrai Hall in Baghdad Governorate on Monday, 29/9/2025, after completing the proposed training program, following approximately the same procedures and conditions used in the pre-tests.

Statistical Methods

The researcher used the Statistical Package for the Social Sciences (SPSS) to obtain the appropriate statistical treatments.

Results

The researcher presented the results of the pre- and post-measurements for the research sample by displaying the means and standard deviations in illustrative tables after conducting the necessary statistical analyses.

Table 3. Results of the pre- and post-measurements for the research sample

Test	Group	Pre-test Mean	SD	Post-test Mean	SD	F value	df	Calculated t	Error Level	Significance
30 m Speed	Experimental	4.3167	0.07312	4.0917	0.02927	0.225	0.047	11.568	0.000	Significant
	Control	4.3367	0.05046	4.2300	0.04195	0.106	0.055	4.749	0.005	Significant
Explosive Strength	Experimental	36.166	1.1690	41.333	1.6329	5.166	1.471	8.598	0.000	Significant
	Control	35.500	1.5165	37.666	0.81650	2.166	1.471	3.606	0.015	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Agility	Experimental	16.108	0.06080	15.518	0.03061	0.590	0.042	33.691	0.000	Significant
	Control	16.120	0.06542	15.891	0.24103	0.228	0.211	2.605	0.000	Significant
Specific Endurance	Experimental	6.7167	0.54924	8.0167	0.42622	1.3	0.414	7.678	0.046	Significant
	Control	6.550	0.524	7.2167	0.24014	0.666	0.344	4.740	0.005	Significant
Fast Break	Experimental	9.1167	0.11690	8.4500	0.04243	0.666	0.119	13.672	0.000	Significant
	Control	9.1883	0.11974	8.6883	0.24236	5.00	0.21	5.831	0.002	Significant

Table 4. Differences between the experimental and control groups in the research variables (post-test)

Variable	Experimental Group Mean	SD	Control Group Mean	SD	t-value	Error Level	Significance
30 m Speed	4.0917	0.02927	4.2300	0.04195	-6.624	0.000	Significant
Explosive Strength	41.3333	1.63299	37.6667	0.81650	4.919	0.001	Significant
Agility	15.5183	0.03061	15.8917	0.24103	-3.764	0.004	Significant
Specific Endurance	8.0167	0.42622	7.2167	0.24014	4.006	0.002	Significant
Fast Break	8.4500	0.04243	8.6883	0.24236	-2.373	0.039	Significant

Discussion

Following are some relevant tables that show a significant increase in the physical and skill abilities of youth basketball players. And the researcher explains this change is result of a well-planned tactical training based on maximal aerobic power exercise, achieving an appropriate ratio between physical effort demands and match context (tactical) performance. These specific training tasks were done in an environment simulated to that of a real match, allowing players to practice making quick decisions with fine motor responses accurately. This was reflected positively in the level of performance regarding fast offensive transition.

Training with maximal aerobic capacity exercises gets physical effort to levels close to the maximum aerobic threshold improving cardiac respiratory system efficiency and muscle ability to use oxygen. As a result, this enhanced the own capacity for local endurance needed to repetitively develop tactical patterns during games. Hoff and Helgerud (2004) concluded that at intervals of approximately 90% of maximal aerobic capacity, heart- and lung efficiency are improved, and so is economy therefore positively impacting performance on team sports (Hoff & Helgerud, 2004, p. 178).

One of the main reasons for this development is the integration of physical and tactical components within a single training unit. Training was not limited to developing speed or endurance in isolation from tactical situations; instead, these abilities were

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

employed to serve direct tactical objectives, such as rapid transition from defense to offense. This integration enhanced neuromuscular efficiency and motor coordination, which is consistent with the findings of Sheppard and Young (2006), who indicated that combining motor skills with tactical situations contributes to the development of agility and neuromuscular coordination more effectively than traditional isolated training methods (Sheppard & Young, 2006, pp. 919–932).

The superiority of the experimental group can also be attributed to the comprehensive scientific approach adopted in the training program, which combined the development of specific physical fitness components (speed, explosive strength, agility, and specific endurance) with the practical application of tactical concepts within a match-like training environment. This made physiological and physical adaptations more closely linked to the actual performance demands of basketball.

Also, this training type based on high-intensity intermittent effort dished out to improved players' capacity to sustain fatigue following prolonged action. The following are all stimulated in the same workout so specific endurance is improved for both aerobic and anaerobic systems. These results are in agreement with those reported by Bangsbo et al. This led them to speculate about (2006), which showed whilst training at maximal aerobic capacity on an intermittent basis had been shown to improve muscular endurance, as well as fatigue resistance when it comes to repeated performance in team sports (Bangsbo et al., 2006, pp. 10–27). Therefore, the findings gathered in this research seem logical and agree with modern scientific works.

Conclusions

1. It was found that the use of the tactical exercises that were carried out with regard to maximal aerobic capacity directly helped improve basic physical abilities in youth basketball players.
2. Among youth basketball players, specific exercises contributed to improved speed.
3. These exercises led to an increase in explosive strength in youth basketball players.
4. All of these exercises help improve motor agility in youth basketball players.
5. However, these exercises were effective to optimize specific endurance in youth basketball players.
6. These drills were beneficial in developing fast-break transition speed among youth basketball players.

Recommendations

1. Tactical exercise based on maximal aerobic capacity should be integrated into youth basketball training programs.
2. There should be focus on the incorporation of physical training within the tactical plans, which will help maximize players' overall performance.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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3. As a result, increased intensity of training load must be applied in a progressive fashion to facilitate physiological adaptations of the muscles and minimize muscular fatigue.
4. Increased use of a high-intensity intermittent training approach is advised to improve specific endurance and performance in rapid transitions.
5. We recommend conducting the same studies on different age groups and performance levels.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Educational Leadership as a Tool for Social Cohesion: Strategic Management Methods of Schools in Promoting a Culture of Peace and Citizenship in Lebanese Society

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Abstract

This study looks into how educational leadership can help build social cohesion in public schools in Lebanon. It digs into different ways that school management can be approached, focusing on creating a culture rooted in peace and citizenship. Method A questionnaire of closed questions was applied to a stratified random sample of 217 school principals, using the descriptive-analytical method. The findings indicated that there is a positive and strong relationship (r = 0.702) between the competence of educational leadership in implementing strategic tools and the level at which social cohesion was promoted. As for current parliamentary leadership activity, it revealed good performance (average 3.40) but was short of the desirable level (3.70). Key structural barriers that were identified included.

Keywords: Educational Leadership, Social Cohesion, Strategic Management, Culture of Peace, Citizenship, Lebanon.

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Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Lebanese society is experiencing fast-paced changes and challenges complicating its social fabric and coexistence" (Awad, 2021, p23). In this sense, the school becomes a key institution in establishing the resilience of society, as well as social cohesiveness (Al-Dosari, 2025, p54). The role of the educational institution is not only limited to the transfer of knowledge but constitutes a key role in the formation of awareness and the establishment of citizen-oriented values and character (Al-Fuhhal, 2025, p320). The key driver of this phenomenon constitutes the educational leadership, which is equipped with an active vision transforming the general objectives into concrete plans. The Lebanese social entity constitutes a microcosm of society, where all parts come into contact within the school framework of a small society (Al-Jarrad, 2025, p87).

This requires a kind of education leadership that is informed and practicing strategic intelligence management to convert the school from a potential space of division to a functional environment that leads to dialogue, acceptance of the other, active citizenship, and positive peace (Ali, 2025, p34).

Recent studies have further deepened both the theoretical and practical perspective of educational leadership in fostering social cohesion and citizenship, with key references to the most complex societal contexts. Locally, the research by El, Amine (2023) on school principals' behavioral situation under stressful situations caught my eye. The paper focused on the adaptive leadership practices of school principals during the crises that followed one another. The discoveries of the research, which were based on the interviews and observation of the field, indicated that the school principal's shift to "symbolic and communicative leadership" was at the core of the effective change of the school into a community sanctuary that was united in itself, thus giving a practical example of how important the community partnership, building strategy is, as was emphasized in the present study.

In a similar context, resolving the sectarian challenge, a research by Bou Zeid & Akar (2022) explored how principals of Lebanese schools dealt with and put into practice citizenship education in varied classrooms. The study, based on a multiple case study method, found that the key to the process was the formation of secure and well, organized dialogic spaces called "participatory management of concerns" thus, these spaces were instrumental in not only facilitating the current research's engagement with open dialogue as a central leadership practice but also enhancing it.

Internationally, the systematic international literature review carried out by Khalifa et al. (2021) explains a theoretically comprehensive framework of culturally responsive leadership that, based on their findings, achieves its most powerful outcome if the leadership expanse overcomes the school context in order to engage and be involved in the struggle against exclusionary policies in education. This indicates the wider systemic and community context within which leadership has to operate, thereby aligning with the empirical findings of the current study concerning the necessity of overflowing the challenge posed by structural limitations via national institutional intervention. On the other hand, concerning theoretical application, the work of Shields (2020) on transformative leadership, particularly the definition of its core notion: "genuine democratization of decision, making, " provides an excellent theoretical basis for one of the fundamental strategic courses taken within the framework of the current study: participatory strategic planning. Faour & Alameh (2024) carried out a comprehensive piece

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

of research work that enhances the current state of the art within the sector, having established a quantitative link between leadership practices concerning teaching and learning, and their connection with the civic outcomes of students within the Lebanese context.

Their survey, based results and analysis have shown the most important factor for developing civic knowledge and skills was the emphasis on the need to ensure a high and fair academic expectation by the leadership of the learning institutions. The results are consistent with the current research study because the quality of the entire learning environment and the issue of Social Cohesion/Citizenship are very complex issues that the study seeks to address.

As a consequence, it is essential to acknowledge that the purpose of this study is to understand, deconstruct, and analyze, in light of the aforementioned principles, the management processes of this form of leadership, as well as the tools and methods that can be implemented by institutions of learning with a view to making these institutions incubators of social cohesion, training agents of stability and construction.

This investigation offers the following tangible scientific contribution:

a. presing an applicable conceptual framework that interlinks leadership roles within educational institutions and social cohesion strategies for the Lebanese case.

b. Presentation of quantitative field evidence (correlation coefficient of 0.702) establishing the relationship between leadership competitiveness in using strategic methods and an improvement in social cohesion.

c. Observing the gap existing between the present performance levels in the role and the highest possible levels, and diagnosing the critical structural barriers that limit such a role in regard to societal behaviors, scarce resources, political factors, and so on.

d. The suggestion of a series of indicators to assess the social function of the school and provide recommendations based on evidence to stakeholders such as policymakers, school administrators, and the community.

The central issue revolves around the disconnect between the strategic role expected from the leadership in the educational sector in improving societal cohesion and the practices within Lebanese schools, which could or could not promote a culture-based approach on the principles of peace and active citizenship.

The primary research question is: "How might educational leadership, through the use of strategic management best practices, improve the role of education in enhancing social cohesion and establishing a culture of peace and citizenship in Lebanese society?"

Subsidiary questions include the reality of existing practices, efficient methods and strategies, problems, success factors, and key suggestions.

Main Hypothesis: There is a strong positive correlation between the competence of educational administrators in applying strategic management techniques and the extent of enhancement in social cohesion.

Subsidiary Hypotheses: Investigate differences between present and optimal practices, the impact of particular strategic approaches, the existence of challenges/hindrances, the feasibility of success factors, and the efficacy of recommended solutions.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Methodology

Model of this study

Proposed Model Relationships: Educational Leadership positively influences the application of Strategic Management Methods.

Structural Obstacles act as a negative moderating factor, weakening the above relationship.

The application of Strategic Management Methods, in turn, has a strong positive effect on Enhancing Social Cohesion.

The components of each variable (Leadership, Methods, Obstacles, Cohesion) are detailed separately within the model.

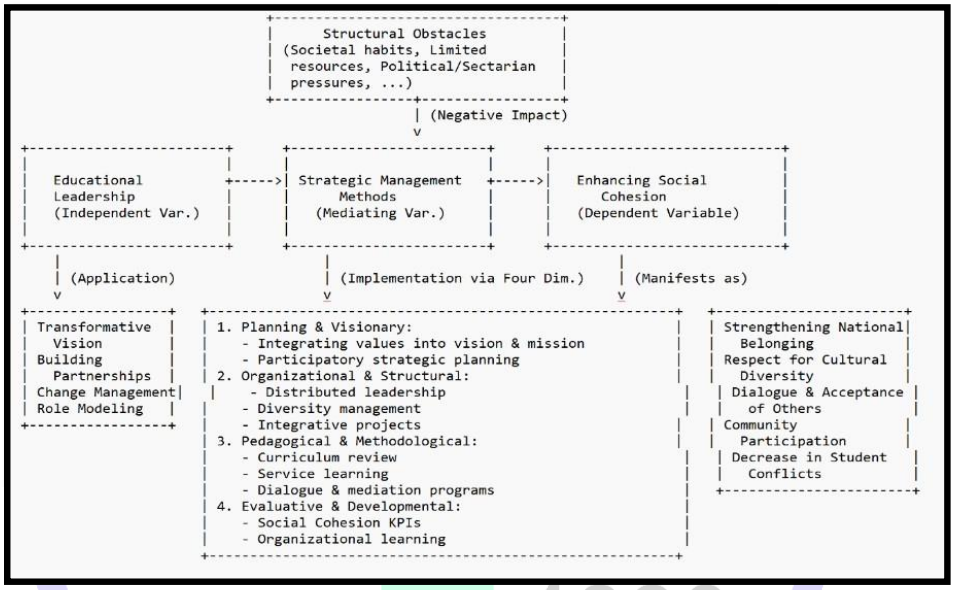

Figure 1. *Simplified Model of the Relationship Between Educational Leadership and Social Cohesion in Lebanese Schools*

Methodology and Sample

The study employed a descriptive, analytical methodology. A closed, standardized questionnaire was created and sent to a stratified random sample of 217 public school principals from all the Lebanese governorates. The instrument's validity and reliability (Cronbach's Alpha > 0. 70) were established. Data analysis was conducted using SPSS, and both descriptive and inferential statistics (t, tests, ANOVA, correlation, and regression) were used.

The study used a descriptive, analytical methodology. To collect data a closed, standardized questionnaire was designed, which consisted of four main sections targeted at measuring: (a) leadership practices currently utilized to enhance social cohesion, (b) the degree of using strategic management methods, (c) structural obstacles for implementation, and (d) success measurement indicators.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Construction of Scale Items and Sub-dimensions

The questionnaire items and sub, dimensions were carefully and systematically traced back to the theory framework of the study. As illustrations:

• The aspects of Leadership Practices such as "Strengthening national belonging" and "Encouraging open dialogue" are very closely linked to the leadership mechanisms.

• The aspects of Strategic Management Methods such as "Strategic planning" and "Building community partnerships" have been identified in accordance with the four facets of strategic management which were Planning, Organizational, Pedagogical, Evaluative.

• The vocabularies of Obstacles and Success Indicators have been constructed from the pieces of literature and the analysis of the Lebanese context that have been dealt with in the Introduction and Theoretical Framework respectively.

The tool used a five, point Likert scale (1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree) to indicate the respondents' attitudes and their level of agreement with the statements. The following classification criteria were used to interpret the calculated arithmetic means: Low: Mean from 1. 00 to 2. 33 Medium: Mean from 2. 34 to 3. 66 High: Mean from 3. 67 to 5. 00 A questionnaire was handed out to a stratified random sample of 217 principals of public schools from the six Lebanese governorates.

The instrument's validity (through expert judgments) and reliability (Cronbachs Alpha > 0. 70) were supported.

The data collected was analyzed by the aid of the Statistical Package for the Social Sciences (SPSS), employing descriptive statistical techniques (Mean, and Std. Deviation) and inferential statistical techniques (t-tests, ANOVA, Correlation Coefficients, Regression).

Terminology

Educational Leadership:

is the use of developing a vision, providing direction, and providing support for teachers, employees, students, and learning communities. In formal leadership capacities and in the role of influence, educational leadership is the essence of leading learners to knowledge and skills for their world. (Bittour, 2025, p98).

Social Cohesion

The degree of interconnection, harmony, shared identity, mutual trust, and acceptance of diversity among members of a society (Khemis, 2022, p56).

Strategic Management

A dynamic process of proactive planning and implementation of strategies to transform the school into a platform for peace and shared identity (Mahdi, 2025, p87).

Culture of Peace

The active construction of practices and values that reject violence and promote dialogue, tolerance, and justice (Mohamed, 2025, p54).

Active Citizenship

Promoting belonging to the nation above sectarian affiliations and participating in public affairs based on equality and responsibility (Mohamed, 2024, p9).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Theoretical Framework

The school is the main platform through which values are built and the principles of active citizenship are instilled, especially in diverse societies such as Lebanon.

Educational leadership hence moves beyond the typical management of resources to becoming a social actor who is able to predict the future.

Educational Leadership for Social Cohesion

Leadership brings this about through

- Embedding peaceful and civic values into the educational process.
- Establishing safe places for dialogue among students from diverse backgrounds.
- Showing by example the values of tolerance and equity.
- Establishing community partnerships to expand the school's role as a link for communication.

Strategic Management as a Guide

Poor strategy management has disastrous consequences:

• market share erosion
• missed opportunities for growth
• resource waste
• employee disengagement.
• The business collapsed.

Get it right, and you will open yourself up to a whole different world of possibility. Done correctly, a strategic management plan leads to sustainable competitive advantage, accelerated growth, more profitable operations, fluid market adaptability, and even alignment within the organization.

Results and Discussion

Demographic Data of the Sample (n=217)

The geographic location and variety of credentials and professional experiences in this sample reflect many distinct types and locations of educational experience. Almost half (48. 4%) of the sampled principals are reported to hold postgraduate degrees, and over four-fifths (82. 5%) have at least five years of experience in the position they were responding about, lending even greater credibility to their answers.

Analysis of Current Leadership Practices

Table 1. Current Leadership Practices

Level	Arithmetic Mean	Practice
Very High	3.51	Strengthening national belonging
Very High	3.46	Developing leadership skills

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Table 1. Current Leadership Practices

Level	Arithmetic Mean	Practice
Very High	3.40	Organizing coexistence activities
High	3.35	Integrating citizenship values
High	3.28	Encouraging open dialogue
High	**3.40**	**Overall Mean**

A clearly positive trend can be observed, however, the overall mean (3. 40) is still below the optimal level (3. 70). The item "Encouraging open dialogue" received the lowest score, which indicates that it might be seen as a risky activity or that it requires a higher level of skills.

Analysis of Strategic Management Methods

Table 2. Strategic Management Methods

Method	Arithmetic Mean	Level
Building community partnerships	3.25	High
Applying change management	3.20	High
Using strategic planning	3.19	High
Using knowledge management	3.19	High
Organizing teacher training	3.16	High
Overall Mean	**~3.20**	**High**

Application of strategic methods is at a high level but to a lesser extent than general practices. The emphasis on external partnerships rather than internal capacity, building (training) may indicate a shift towards "crisis management" mode rather than that of long, term strategic development.

Analysis of Implementation Obstacles

Table 3. Implementation Obstacles

Obstacle	Arithmetic Mean	Level
Societal habits and traditions	3.58	Very High

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Table 3. Implementation Obstacles

Obstacle	Arithmetic Mean	Level
Limited material resources	3.56	Very High
Lack of official support	3.52	Very High
Political and sectarian pressures	3.51	Very High
Difficulty unifying visions	3.40	Very High

Obstacles are fundamentally structural and societal in nature. This means individual efforts of principals hit rigid systemic walls.

Analysis of Success Measurement Indicators

Table 4. Success Measurement Indicators

Indicator	Arithmetic Mean	Level
Engagement in voluntary activities	3.04	High
Awareness of rights and duties	3.04	High
Respect for cultural diversity	2.98	Medium
Participation in community activities	2.94	Medium
Decrease in conflicts among students	2.84	Medium

Schools are more successful in promoting positive values such as responsibility and awareness than in dealing with tensions and everyday conflicts, indicating a special need for conflict resolution programs.

Hypothesis Testing

Main Hypothesis Test

Table 5. Main Hypothesis Test

Statistical Indicator	Value	Interpretation
Correlation Coefficient (r)	0.702	Strong positive correlation
Coefficient of Determination (r^2)	0.493	Leadership explains 49.3% of variance
Significance (p-value)	< 0.001	Highly statistically significant

Result: Hypothesis Accepted. A strong, significant positive correlation exists.

First Subsidiary Hypothesis Test

Result: Hypothesis Accepted. A statistically significant negative performance gap (-0.30) exists between current practices (mean 3.40) and the optimal level (3.70).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Second Subsidiary Hypothesis Test

Result: Hypothesis Accepted. Multiple regression showed that strategic methods (integrating values, building partnerships, strategic planning, change management) significantly increase school effectiveness. Schools applying these methods had higher effectiveness (3.65 vs. 2.90).

Third Subsidiary Hypothesis Test

Result: Hypothesis Accepted. All five obstacles recorded high means (3.40-3.58) and were confirmed to have a statistically significant negative effect on leaders' capacity.

Fourth and Fifth Subsidiary Hypotheses Tests

Result: Both Accepted. A set of measurable indicators was validated, and the proposed recommendations received a very high evaluation (mean 4.24/5), with an expected 35-40% improvement in social cohesion indicators.

Comparison of Results with Previous Studies

In order to further develop the implications of the results of the present study and to aid in the positioning of the study within the existing body of knowledge, this section will provide a comparison of the present study's main results with those obtained by other influential studies conducted on closely related issues.

Comparison with the study by El-Amine (2023)

Previous Study: The report by Amine El Alis (2023) looked at how Lebanese School Heads responded to multiple crises (Economic Crisis & Health Crisis). The research showed that there was critical dependence on 'Symbolic & Communicative Leadership'. These types of Leadership were instrumental in changing the School into a "Community Platform" as well as providing stability/support/strength within the community.

Relevant Finding from the Current Study: The findings revealed that 'building community partnerships' was the most emphasized strategy of principals (mean 3. 25) indicating a profound understanding of the significance of this external role of the school.

Points of Agreement and Distinction: Both studies concur that community partnerships play a vital role as a strategic tool to foster social cohesion and build institutional resilience, particularly in the context of scarce official resources. On the other hand, the studies diverge in that the present research has demonstrated a numerical extent to which this strategy has been employed among a wider range of methods and has established a direct connection between the implementation of this strategy and the increase of school effectiveness in achieving cohesion (by regression analysis), whereas El, Amine's study was only limited to explaining the functioning of this mechanism in the crisis context.

Comparison with the study by Bou Zeid & Akar (2022)

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Previous Study: The school leadership in Lebanon through safe and structured dialogic spaces for citizenship education was analyzed by the Bou Zeid & Akar's (2022) study. They referred to this process as "participatory management of concerns.

Current Study Relevant Finding: "Encouraging open dialogue" was ranked as the lowest practice of leadership in the current study in terms of the level of application (mean 3. 28). Principals were the ones to point out that this activity demands them to have advanced skills and that it may involve some risks.

Points of Agreement and Disagreement: Both studies concur in the diagnosis of the problem of constructive dialogue activation in the sensitive Lebanese context. Nevertheless, Bou Zeid & Akar's study concentrated on describing successful models for achieving this dialogue, whereas the present study unveiled a larger picture showing that this particular practice is the least prevalent among principals nationwide. It not only confirms the existence of a wide application gap but also reinforces the urgent need for the training recommendations provided in this study.

Comparison with the review by Khalifa et al. (2021)

Previous Study: An international systematic review by Khalifa et al. (2021) determined that one of the most significant effects of culturally responsive leadership is when it goes beyond individual schools and includes "advocacy and struggle against exclusionary policies" at the systemic level.

Current Study Relevant Finding: Principals considered "political and sectarian pressures" and "lack of official support" as the topmost significant structural obstacles that impede their work (with means of 3. 51 and 3. 52, respectively).

Points of Agreement and Difference: The two studies have strong agreement in that they confirm that the most fundamental obstacles are systemic and political in nature and not individual ones. The international review, in fact, offers a theoretical framework that explains why leadership should work at two levels: the school and the community. The current research goes beyond the theory by providing empirical evidence from the field in Lebanon that not only supports the hypothesis but also demonstrates that these systemic obstacles are a daily reality in the local context which makes it difficult to apply strategic methods. This corroborates the first of its key recommendations, which is a call for national institutional intervention.

Comparison with the work by Shields (2020)

Previous Study: Shields (2020), in the transformative leadership model, considers the "genuine democratization of decision, making" as the core mechanism for creating just and cohesive schools.

Relevant Finding from the Current Study: The study considers "participatory strategic planning" as one of the essential dimensions of strategic management, which is about involving teachers, students, and parents in creating the school's vision.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Points of Agreement and Distinction: Both studies agree theoretically that participation and democracy in management lead to cohesion and justice. The current study, however, goes further to add practical value by specifying these principles as a set of distinct, measurable "strategic management methods" and by empirically examining their statistical relationship with school effectiveness. That is, the current study operationalizes Shields' theoretical abstraction to a field variable for investigation in the Lebanese context.

Comparison with the study by Faour & Alameh (2024)

Previous Study: Faour & Alameh (2024) in their Lebanese study found that "leadership focus on high academic expectations for all" was the most powerful predictor of positive civic outcomes for students.

Current Study Relevant Finding: The performance of the leadership in the practices "developing leadership skills" (mean 3. 46) and "organizing coexistence activities" (mean 3. 40) was highly rated.

Agreement and Disagreement Points: Both studies emphasize the relationship between the overall quality of the school environment (academic, leadership, related, or activity, based) and socialization and citizenship outcomes. In the previous research by Faour & Alameh, the focus was on students' specific outcomes (civic knowledge and skills), whereas the current study highlights principals' practices and strategies as a means of achieving general social cohesion. They may be seen as two sides of the same coin that complement each other: the current study looks at leadership "inputs" and "processes, " while Faour & Alameh's study looks at specific student "outputs" from those processes.

Conclusions

- Educational leadership represents a major factor for social cohesion and has a strong correlation (0. 702) to its enhancement.
- Leaders understand their societal role, however, they do not have the necessary tools, resources, and training to make this role fully effective and sustainable.
- Using participatory planning and community partnerships as methods provides practical and effective tools for school transformation.
- The difficulties faced are mostly systemic (societal habits, politics, resources) and thus, require intervention by institutions at the national level.
- The school, with a clear vision, safe spaces for dialogue, and institutional support, can become an effective social cohesion incubator.
- The research was able to create and test a set of indicators to assess the social role of the school.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

For Policymakers (Ministry of Education, CERD)

- Design and distribute a national standard framework for educational leadership that emphasizes citizenship and peace competencies.
- Provide a supportive budget and technical resources so that schools can carry out social cohesion projects.
- Analyze and update the curriculum and extracurricular activities to reflect the values of dialogue, citizenship, and conflict resolution.

For School Principals

- Involve the community in strategic planning through participation of teachers, students, and parents, thus defining a school vision reflecting citizenship values.
- Create and enhance the strategic collaborations with local institutions and civil society for community activities that benefit all sectors.
- Implement collaborative learning and dialogue, based strategies that are effective in promoting positive interaction among diverse students.

For Teachers and the Community

Participate actively in the development and implementation of citizenship and peace programs in the school.

Extend the family's and local community's role to become co, operators with the school in fulfilling its mission.

Future Research Proposals

- Conduct longitudinal studies to track the long, term impact of the recommended strategies.
- Expand the study to include private and vocational schools for comparative analysis.
- Investigate the role of technology and e, learning in promoting peace and citizenship values.
- Let us look at the areas in Lebanon and compare them to see what makes some places successful in their own way. We want to find out what works well in each region. This will help us understand the things about each Lebanese region that

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

contribute to its success. We are talking about the regions and how they are different, from one another.

- Develop an electronic platform for sharing best practices among Lebanese schools.

Conclusion

The findings of this research demonstrate that when educational leadership is successfully implemented, it will transform schools to be safe and nurturing environments for their students and build young citizens. Despite the significant barriers to success at the macro/micro level, the data indicate that educational leadership could be successful if the strategies are planned and implemented in a deliberate manner. It is a wise move to start with the leadership of education when the question of social fragmentation in Lebanon, as a challenge of existence, is considered. It is not only a vital need for the country at present, but also a great opportunity for the future to let the school play a bigger role in social cohesion. Thus, the next generations will be able to build a united society based on active citizenship and sustainable peace.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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The effect of strength training on blood levels of (lysine and valine) in tennis players

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Abstract

The purpose of this research was to investigate the effect of strength training program on blood lysine and valine levels in tennis players. 6 players aged 18–20 years were sampled. The training intervention was implemented over 8 weeks, 3 sessions per week. Plasma lysine and valine were determined before and after the training period. Results indicated that the contents of lysine and valine increased evidently following training. The finding also indicated that muscle strength and endurance were significantly improved after the training program. It is possible to infer that the training program was beneficial for lysine and valine levels, muscle strength and tennis endurance in players.

Keywords: Lysine, Valine, Muscle strength, Endurance, Tennis.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Tennis is considered a highly physically demanding sport that requires neuromuscular coordination and muscular strength. Players need to be quick and deft, hit hard and sharp and last long. For that reason, strength training is one of the most important elements in training for tennis players. The present study could lend support to the effects of strength training on lysis, and valin among male tennis players. In addition, this investigation might help coaches and players in optimizing training programs for better athletic performance.

Even though resistance exercise is very important in tennis training, only a few studies have investigated the effects of strength training on lysine and valine levels in athletes. Hence, we proposed to study the influence of a strength training program on blood lysine and valine levels in six tennis players.

Research Objectives:1. To identify the effect of strength training on the levels of lysine and valine in the blood of tennis players. 2. To ascertain the extent to which strength training influences athletic performance (muscle strength, speed, endurance) in athletes.

Research Hypotheses: 1. There is a significant difference in the level of lysine in the blood between pre-tests and post-tests following the implementation of the training program for tennis players. 2. There is a significant difference in the level of valine between pre-tests and post-tests following the implementation of the training program for tennis players. 3. There is a positive effect of strength training on athletic performance (muscular strength, speed, endurance) for tennis players.

Research Domains: 1- Human Domain: 6 tennis players for the year 2024-2025. 2- Spatial Domain: Al-Shabab International Tennis Court. 3- Temporal Domain: From April 1, 2025, to June 2, 2025.

Definition of Terms

Strength Training: Strength training refers to physical exercises aimed at increasing muscular strength. These exercises include weight lifting, resistance training, and aerobic exercises. (American College of Sports Medicine, 2018)

Lysine: Lysine is an essential amino acid that plays a crucial role in protein synthesis. It is necessary for the growth and maintenance of healthy body tissues. (Berg, 2002)

Valine: Valine is an essential amino acid, and it is a key player in protein construction. You need protein for building and maintaining healthy body tissues. (Berg, 2002)

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Athletic Performance: It is the capabilities of a sportsperson of performing and achieving in sports. This package of abilities includes both speed, strength and stamina, as well as flexibility and control over movement. (Bompa, 2009)

Methodology

This chapter intends to presents the research methodology used in one of the studies investigating a strength training intervention on blood lysine and valine concentrations in tennis players. The research was an experimental study over the influence of a training model on the experimental group.

The experimental research design for a single group was employed, wherein the training program was implemented on the experimental group, and the levels of lysine and valine in the blood were measured before and after the training program.

Research Samples

A sample of six players from the Army Tennis Club in Baghdad, aged between 18 and 20 years, was selected. The sample was chosen randomly from among the players who are training in tennis.

The homogeneity of the sample was confirmed prior to the commencement of the training program, as shown in table 1.

Table 1. *Homogeneity of the Research Sample*

Variable	Sample (n = 6)	Mean	Standard Deviation	Skewness
Age (years)	19.5 ± 1.2	19.5	1.2	0.21
Body mass (kg)	65.2 ± 8.5	65.2	8.5	0.35
Height (cm)	175.3 ± 6.2	175.3	6.2	0.18

Conclusion: The sample is homogeneous in the aforementioned variables, and the skewness coefficient is close to zero, indicating that the distribution is near a normal distribution.

Tools and Devices Utilized in the Research

- Arabic and foreign sources
- The Internet
- Registration forms
- Tennis rackets
- Tennis balls

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Tennis court
- A strength training program that includes exercises aimed at increasing muscular strength.
- An electronic weight measurement device for assessing the weight of the players.
- An electronic blood pressure monitor (HEM-907XL) for measuring the blood pressure of the players.
- An electronic calculator
- A laptop (DELL)

Tests Used in the Research

1. Blood Levels of Lysine and Valine Test (Berg, 2002)
    - Objective: To measure the levels of lysine and valine in the blood.
    - Tools: Device for measuring blood levels of lysine and valine.
    - Procedures:

Obtain a blood sample from the player.
Separate plasma from cells.
Analyze the sample using the device for measuring blood levels of lysine and valine.

- Measurement Scale: Micromoles per liter.

2. Muscular Strength Test (American College of Sports Medicine, 2018)
    - Name: Muscular Strength Test.
    - Objective: To measure the muscular strength of the player.
    - Tools: Device for measuring muscular strength (Takei, TKP-5000).
    - Procedures:

Position the player in a seated position.
Attach the muscular strength measuring device to the player.
Instruct the player to exert maximum muscular strength.

- Measurement Scale: Kilograms.

3. Speed Test (International Tennis Federation, 2022)
- Objective: To measure the speed of the player.
- Tools: Speed measuring device (Brower, TC-1).
- Procedures:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Position the player at the starting position.
Instruct the player to run at maximum speed.
Measure the time taken by the player to cover a specific distance.

- Measurement Scale: Seconds.

4. Endurance Test (American College of Sports Medicine, 2018)

- Objective: To measure the endurance of the player.
- Tools: Endurance measuring device (Monark, 828E).
- Procedures:

Position the player on the endurance measuring device.
Instruct the player to run at a specific speed for a designated duration.
Measure the time taken by the player to complete the test.

- Measurement Scale: Minutes.

5. Flexibility Test (International Tennis Federation, 2022)

- Objective: To measure the flexibility of the player.
- Tools: Flexibility measuring device (Takei, TKP-5000).
- Procedures:

Position the player in a standing position.
Instruct the player to bend forward.
Measure the distance between the fingertips and the ground.

- Measurement Scale: Centimeters.

The tests were administered on April 1, 2025, at the International Tennis Stadium at 3:00 p.m. 5 CC of blood were collected for a blood test for levels of lysine and valine. Afterwards, the second fitness test of muscle strength, speed and endurance was administered by the sample studied.

Strength Training Program

The strength training program includes exercises aimed at increasing muscular strength.

Duration: 8 weeks

Frequency: 3 times per week

The exercises utilized in the training program for the research are:

1. Chest exercise:
2. Back exercise:
3. Leg exercise:
4. Shoulder exercise:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

5. Abdominal exercise:

These exercises are part of a broader muscular strength training program constructed to improve tennis players' muscular strength levels.

The post-tests were administered at 3:00PM on June2, 2025 Everything that has been employed in the pre-tests was applied under the same conditions as test conditions.

Methods of analysis the research data was analyzed using version 26 of the Statistical Package for the Social Sciences (SPSS).

Results

Table 2. *Presentation of Research Results*

Variables	Pre-tests		Post-tests		Differences t-value Error Level (p)
	Mean	SD	Mean	SD	Mean Diff.
Lysine level (µmol/L)	120.5	20.1	150.2	25.5	29.7
Valine level (µmol/L)	150.2	25.5	180.5	30.1	30.3
Muscular strength (kg)	50.2	10.1	60.5	12.5	10.3
Speed (s)	10.2	1.5	9.5	1.2	−0.7
Endurance (min)	30.1	5.2	35.5	6.1	5.4

Note: *n = 6, significance level ≤ 0.05.*

Discussion

The results (Table 2) also indicate that there was a significant increase in lysine levels after the training program, representing favorable physiological adaptation. As a nutritionally essential amino acid, lysine is critically involved in protein synthesis, hormonal regulation and tissue repair that contribute to athletic performance (Berg, 2002). The detected increase in lysine concentration concurs with previous investigations indicating that structured physical training per se can improve free amino acid levels such as those of circulating amino acids, especially throughout moderate or high level of exercise intensity (Klein et al., 2011; Mikkelsen et al., 2015). This adaptive response could be the result of increased hepatic amino acid synthesis or decreased peripheral utilization of the amino acids by muscle, due to better metabolic efficiency, as indicated previously (Mikkelsen et al. 2015).

Conversely, a significantly higher post-training valine concentration was shown indicating a beneficial effect of the training intervention on branched-chain amino acid metabolism. Valine is important in the synthesis and repair of muscle tissue, and promotes mental vigor and muscle coordination (Berg, 2002). These results are in line with a previous study, which showed that exercise elicits an increase of plasma valine concentrations after exercise, particularly after intense periods of training (Klein et al., 2011; Mikkelsen et al., 2015). Greater availability of valine may promote muscle anabolism and alleviate fatigue, which are potentially beneficial effects for physical performance.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Additionally, there was a notable improvement in muscular strength due to the training intervention and this offers support for the value of using resistance exercises. This is consistent with previously established evidence that systemic resistance exercise stimulates neuromuscular adaptations, such as enhanced motor unit recruitment, hypertrophy and contractile efficiency (Kraemer et al., 2002; American College of Sports Medicine [ACSM], 2018). These types of adjustments are mediators, which also play a role in determining the level of strength expression and hence performance enhancement in numerous sport forms.

With respect to performance, the results demonstrated a significant decrease of movement time after the intervention program that can be considered as a meaningful improvement in terms of speed. Speed, being the capability of movement with minimal time, is dominantly influenced by neuromuscular coordination and muscle power as well as environmental factors such as mechanical efficacy (ACSM, 2018). As seen in previous studies, the noted enhancements could have been due to enhanced muscle fiber recruitment patterns, improved intermuscular coordination and an increase in elastic energy (Kraemer et al., 2002). Furthermore, improvements in muscle efficiency could have played a role in lowering the energy consumption and increasing movement economy, which allowed for faster performance.

In addition, endurance capacity also showed a substantial improvement after the training intervention, which means that aerobic and muscular endurance improved. Endurance, characterised as the capacity to endure extended periods of physical activity is strongly linked to cardiovascular function, changes in mitochondria and enhanced metabolic control (ACSM, 2018). The present improvement was consistent with previous researches which have reported that a well-structured training can contribute to marked increase of endurance performance by high oxidative capacity, delayed fatigue, and efficient substrate utilization (Kraemer et al., 2002; ACSM, 2018). Together these modifications allow the competitive athlete to perform more continuously at higher performances for longer periods in time.

Overall, these results provided strong evidence that the applied training program was effective in promoting advantageous biochemical, neuromuscular and physiological adaptations to bring about a holistic enhancement of physical performance. The combination of resistance and conditioning components seemed to have maximally improved amino acid turnover, muscle strength, power and endurance suggesting the significant role of well-designed training program in sport development.

Conclusions

1. The present study revealed that blood levels of lysine and valine are positively affected by strength training in tennis players with beneficial effects on muscular strength, speed and endurance.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2. There was an increase also in blood lysine and valine levels following strength training.
3. Significant increase was found in the muscle strength after treatment, indicating that the applied training program had a significant effect on it.
4. Results showed a significant reduction in speed post training, suggesting that the training program led to decreased running speed.
5. Endurance also improved after the training program and there was a significant correlation with improvement in endurance post-training.

Recommendations

1. It is recommended that strength training be included in the program of conditioning for tennis players and this will help to increase levels of lactate and valine in the blood, consequently resulting in increased muscular strength, speed and endurance.
2. Trainers should measure the lactate and valine in the blood of tennis players to evaluate changes resulting from strength training on performance.
3. From the abundance of lactate and valine in the blood, individual training programs can then be prepared for each tennis player to optimize (even increase) tennis endurance.
4. Additional research is needed to examine the effect of strength training on blood lactate and valine levels in tennis players, which would provide valuable insight into improving athletic performance.

Appendix 1. *Model of a Single Training Session*

Objective: To improve muscular strength in tennis players.

No.	Exercise	Sets	Repetitions	Load	Rest
1	Chest exercise (dumbbells)	3	8–12	20 kg	60 s
2	Back exercise (barbell)	3	8–12	25 kg	60 s
3	Leg exercise (leg press machine)	3	8–12	30 kg	60 s
4	Shoulder exercise (dumbbells)	3	8–12	15 kg	60 s
5	Abdominal exercise (abdominal machine)	3	8–12	—	60 s

Notes:

1. Players should begin with light loads and gradually increase the weight as the training program progresses.
2. A rest period of 60 seconds should be maintained between sets.
3. Players are advised to consume a healthy post-workout meal following the training session.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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analytical study of the competitive excellence of the sports clubs of the Iraqi Ministry of Interior from the perspective of the employees

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Abstract

The study aimed to develop a measure of competitive excellence for sports clubs affiliated with the Iraqi Ministry of Interior from the perspective of employees and to identify the level of competitive excellence of these clubs from the perspective of employees. The researcher used a descriptive approach with a survey method and correlational studies. The researcher constructed a measure of competitive excellence for sports clubs from the perspective of employees, and the results were processed using SPSS statistical software. The results were presented in tables and points and discussed. The study concluded that the sports clubs of the Iraqi Ministry of Interior have a good level of competitive excellence from the perspective of employees. The researcher recommended the need to activate this administrative concept and emphasize its application in the field within sports clubs and institutions In order to lead and stay ahead of competing clubs, the administrations of sports clubs affiliated with the Iraqi Ministry of Interior should enroll their employees in advanced development and educational courses, with the aim of raising their level and job efficiency, as well as informing them of everything new in the field of distinguished sports management.

Keywords: Competitive excellence, analysis study, sports clubs.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Introduction

The current era is witnessing a significant array of changes and challenges characterized by the knowledge and information revolution, globalization, and their various repercussions. These challenges have led to changes in work processes and a qualitative change in the composition of human staff deployed by many enterprises. Second, there has been a proliferation of managerial techniques that can be used to increase the efficiency of organizations and for improving the performance. As a result, there is an increasing need to embrace institutional excellence as a factor of success for organizations, organizational performance and customer satisfaction enhancement as well as getting rid of the usual white administrative practices. Accordingly, the quest for new methods of management has become a universal call to adjust to worldwide transformations. The model of competitive excellence is as significant off as well as on the field in encouraging survival, continuity and development within all sporting and non-sporting Institutions. Therefore, excellence is considered one of the fundamentals of success for sports clubs and is a crucial element of strength and sustainability in an era of competition that necessitates the investment of all material and human resources to achieve the objectives of sports clubs through winning championships or competing. This leads to the establishment of correct pathways for these institutions to achieve their excellence. Hence, the significance of this research lies in its focus on one of the important axes in the list of administrative topics, namely the concept of competitive excellence, which could represent a turning point for the sports clubs under the Ministry of Interior in Iraq if implemented and if the reality of competitive excellence among the employees of these clubs is recognized. Additionally, it provides an intellectual and scientific discussion on a contemporary topic in management thought, contributing to enriching the Iraqi sports library with subjects addressing competitive excellence and theoretical frameworks that assist sports institutions and researchers in benefiting from them (Jawad & Athaab, 2021).

Due to the researcher's expertise and observation of the problem while working in one of the directorates affiliated with these clubs, as well as his direct insight into the prevailing climate, the study aims to highlight this concept regarding the positive and effective role that leads to the development of the administrative work reality, aligning it with the current phase. Despite the importance of competitive excellence advantages of sports institutions especially sports clubs, quite disturbing is the fact that very little is known about the level (test-outcome) of competitive superiority possessed by these organizations (Hameed, 2020). And this lack of clarity causes management to fumble its way through leadership, leading their troops in a direction without clear motivation. Consequently, the research problem is reinforced by the absence of a study on the competitive excellence of these clubs. Thus, the research problem is concentrated on the following question:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- What is the level of competitive excellence available in the sports clubs of the Iraqi Ministry of Interior from the perspective of the employees, and what is the level of its application? Addressing this question aids in understanding the operational system of management within these sports clubs and in identifying administrative leadership that aligns with the internal and external challenges and aspirations facing the development of sports institutions at present, particularly regarding the establishment of effective leadership upon which performance depends.

The study aims to: 1. Construction of a Competitive Excellence Scale for Sports Clubs of the Iraqi Ministry of Interior from the Perspective of Employees. 2. Identifying the Level of Competitive Excellence of Sports Clubs of the Iraqi Ministry of Interior from the Perspective of Employees.

The research sample included individuals employed in the sports clubs of the Iraqi Ministry of Interior in the capital, Baghdad, from December 11, 2023, to May 16, 2024. Following the completion of all research requirements, the application of the three measures was conducted within the premises of these clubs.

Methodology

The methodology is viewed as a collection of methods and procedures which the researcher applies in order to obtain the outcomes of their research. This is because, according to Muhammad Owais (2003), it is “an approach, organization, strategy or plan of action formed around a set of principles and rules that are used to accomplish the objectives of research work or scientific work” (Owais, 2003: 15). Since the nature of problem fits it, a descriptive method with survey type was used in this study.

Research Community and Samples

The term "community" refers to "all the elements of the phenomenon that the researcher studies, or all individuals, persons, or objects that constitute the subject of the research problem" (Al-Saadawi & Al-Janabi, 2013, p. 30). Therefore, the research community is intentionally defined as the administrators and coaches of the sports clubs under the Ministry of Interior of Iraq, totaling (235) individuals, who are distributed across (6) clubs, representing a percentage of (100%). The research samples are divided as follows: 1. Pilot Test Sample for the Scale: The researcher selected a pilot test sample from Al-Hudood Sports Club through a random draw, consisting of (8) individuals, which represents (3.4%) of the research community, specifically the personnel (administrators and coaches) of the Ministry of Interior's sports clubs. 2. Scale Construction Sample: The sample for scale construction was chosen randomly by the researcher, comprising (86) individuals, representing (36.5%) of the total community of the sports clubs under the Ministry of Interior, which consists of (6) clubs. 3. Final Application Sample for the Scale:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The sample for the application of the study scales included personnel, specifically the administrators and coaches of the sports clubs under the Ministry of Interior, totaling (98) individuals, which accounts for (41.7%) distributed across (6) clubs.

Research tools and information collection methods

- Arabic and foreign sources
- Information network (Internet)
- Expert opinion survey form for determining the dimensions of competitive excellence
- Questionnaire form specifically designed to measure the components of competitive excellence
- Personal interviews.

Field Research Procedures

Defining the Concept of the Scale

The researcher has clearly and comprehensively defined the concept of the scale by identifying the subject of the phenomenon to be studied, which pertains to competitive excellence among administrators and coaches of sports clubs under the Iraqi Ministry of Interior.

Defining the Domains of the Scale

Subsequently, five domains for the competitive excellence scale were identified, which were incorporated into a specific questionnaire after providing a definition for each domain related to this variable. This was done to ensure clarity and understanding for the esteemed experts and specialists, allowing them to provide important feedback regarding the validity and composition of the scale or suggest modifications. Table 1 illustrates the results.

Table 1. *Percentage of Agreement Among Experts and Specialists on the Domains of the Competitive Excellence Scale*

No.	Domain	Experts' and Specialists' Opinions	Excluded	Percentage
		Agree	Disagree	
1	Strategic Planning	15	–	100%
2	Performance Evaluation	14	1	93%
3	Continuous Improvement and Administrative Development	14	1	93%
4	Investment of Human and Material Resources	15	–	100%

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

5	Creativity and Innovation	15	–	100%

Through the responses of experts and specialists, consensus was reached on all the aforementioned areas, resulting in the identification of five domains for this variable: strategic planning, performance evaluation, continuous improvement and administrative development, investment in human and material resources, and creativity and innovation. These domains were agreed upon by the experts and specialists and possess the capacity for formation, thereby yielding a 100% agreement rate among them.

Determination of Scale Items

The researcher formulated the initial version of the scale items, consisting of 36 items distributed across five dimensions of the scale. These items were presented to a group of experts for the purpose of evaluation and judgment regarding their formulation, validity for measuring competitive excellence, the domains included for measurement, and the positive direction of the statements. Additionally, the validity of the five-point Likert scale (Always, Often, Sometimes, Rarely, Never) was assessed. Items that achieved an acceptance rate of 80% and the observations provided by the experts on the questionnaire were accepted, resulting in the inclusion of all items related to competitive excellence.

Table 2. ***Validity of the Items of the Competitive Excellence Scale***

First: Strategic Planning: Strategic planning is the administrative process through which priorities are identified, programs are developed, and policies are formulated to guide the club's behavior and to utilize its various human and material resources to achieve its objectives.

No.	Item	Valid	Not Valid	Notes
1	The club administration clarifies goals and the future vision to employees.	15	0	100%
2	The club administration conducts training and educational courses to develop employees.	12	3	80%
3	The club administration ensures that its plans are clear and understandable to employees.	14	1	93%
4	The club administration identifies material resources and specialized personnel to supervise implementation.	14	1	93%
5	The club administration adheres to implementing plans according to the specified schedule.	15	0	100%
6	The club administration relies on accurate data and information when developing plans.	12	3	80%

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

7	The club administration ensures that all employees are informed of the club's mission from their first days.	13	2	86%
8	The club administration monitors the correct application of strategic tasks and plans to ensure achievement.	13	2	86%

Second: Performance Evaluation: Performance evaluation is the process by which employees' performance is assessed through critical reports to verify their ability to fulfill their duties and responsibilities within the club.

No.	Item	Valid	Not Valid	Notes
1	The club administration evaluates all employees objectively and fairly.	14	1	93%
2	The club administration evaluates employees based on their achieved outcomes.	12	3	80%
3	The club administration addresses weaknesses based on performance evaluation results.	14	1	93%
4	The club administration relies on experts and specialists in conducting performance reviews.	13	2	86%
5	The club administration uses a periodic evaluation form for its employees.	15	0	100%
6	The club administration encourages reciprocal evaluation among employees.	12	3	80%

Third: Research and Development: This refers to the club's conduct of periodic studies on its environment to identify needs and requirements in order to achieve excellence.

No.	Item	Valid	Not Valid	Notes
1	Employees are informed of their achievements compared with the objectives set by the administration to identify strengths and weaknesses.	15	0	100%
2	A specialized advisory unit exists within the club to assist in performance improvement.	12	3	80%
3	There is participation and exchange of views between senior management and employees to improve performance.	13	2	86%
4	The club administration supports continuous training and development programs for administrative and technical staff.	13	2	86%
5	The club administration allocates the necessary financial resources for research and development.	14	1	93%

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

6	The club coordinates with specialized academic institutions to enhance its achievements.	12	3	80%
7	The club administration periodically reviews its plans and achievements for improvement.	13	2	86%

Fourth: Investment of Human and Material Resources: Highly educated and skilled human resources represent a strategic dimension. Sports institutions should develop intellectual capital characterized by precision, modernity, and efficiency to distinguish themselves from competitors.

No.	Item	Valid	Not Valid	Notes
1	The club administration provides all material and moral resources needed for employees to achieve planned goals.	15	0	100%
2	The club administration constantly seeks to attract and employ highly qualified personnel.	12	3	80%
3	The club administration assigns administrative tasks based on employees' functional abilities (placing the right person in the right position).	13	2	86%
4	The club administration motivates employees through rewards and incentives.	14	1	93%
5	The club administration develops and maintains sports facilities.	15	0	100%
6	The club administration involves employees' opinions when planning and making decisions.	12	3	80%
7	The club administration grants financial rewards to employees and players upon achieving distinguished accomplishments.	13	2	86%
8	The club administration trains and develops employees through internal and external training programs and camps.	15	0	100%

Fifth: Creativity and Innovation: Creativity refers to something entirely new or the development of an existing product or process in a new and different way. It is a cognitive process based on a broad knowledge base.

No.	Item	Valid	Not Valid	Notes
1	The club administration provides material and moral incentives for creative and innovative employees.	14	1	93%
2	The club administration develops new performance methods based on modern technology.	12	3	80%
3	The club administration ensures proper service delivery from the first step to avoid errors.	13	2	86%

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

4	The administration encourages creative employees capable of identifying and solving problems.	13	2	86%
5	The administration continually seeks ideas that help solve problems it faces.	14	1	93%
6	The administration attempts to move beyond traditional thinking when facing obstacles.	12	3	80%
7	The administration develops updated plans that allow it to compete with other clubs.	13	2	86%

Preparation of the Scale Instructions

In order to complete the scale's framework and apply it to the sample, which consists of administrators and trainers, the researcher relied on a five-point scale in formulating the items of the scale. The use of the Likert method is one of the common and established approaches in the construction of psychological scales, as noted by Al-Yasiri (2010, p. 163). This method resembles a multiple-choice format. The scoring was calculated through weights assigned in a positive direction, ranging from 1 to 5 according to the alternatives. The phrase "always" was assigned a weight of 5 points, "often" received a weight of 4 points, "sometimes" was given a weight of 3 points, "rarely" was assigned a weight of 2 points, and "never" received a weight of 1 point, with the reverse applied in the negative direction.

Preparation of Scale Instructions

Scientific Transactions of the Scale

A. The Discriminative Ability of the Competitive Distinction Scale:

The researcher employed the t-test to calculate the discrimination coefficient for each of the 36 items of the scale. The results indicated that the calculated significance level was less than the established significance level (0.05). This implies that the calculated t-values were significant for all items except for item 19, which was not significant. Consequently, the scale comprises 35 items, as illustrated in Table 3.

Table 3. *The Discriminative Ability of the Competitive Excellence Scale*

Item	Group	Statistical Parameters	*t*-value	Error Level (Sig.)	Significance
		Mean (M)	SD		
1	Upper Group	2.043	1.260	2.104	0.041

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

	Lower Group	3.304	1.184		
2	Upper Group	1.739	0.619	5.269	0.000
	Lower Group	3.043	1.260		
3	Upper Group	1.782	0.850	5.571	0.000
	Lower Group	3.086	1.378		
4	Upper Group	1.782	0.421	4.062	0.000
	Lower Group	3.434	1.471		
5	Upper Group	2.260	0.963	2.702	0.010
	Lower Group	3.260	1.321		
6	Upper Group	2.043	0.877	3.872	0.000
	Lower Group	3.086	1.083		
7	Upper Group	2.173	0.716	4.767	0.000
	Lower Group	3.521	0.994		
8	Upper Group	2.565	0.843	4.597	0.000
	Lower Group	2.565	1.079		
9	Upper Group	1.826	0.650	4.773	0.000
	Lower Group	3.217	1.166		
10	Upper Group	2.565	0.945	5.870	0.000
	Lower Group	3.304	1.145		
11	Upper Group	2.391	0.891	2.819	0.007
	Lower Group	2.565	1.273		
12	Upper Group	2.173	0.576	2.798	0.008
	Lower Group	3.521	1.201		
13	Upper Group	2.173	0.777	4.363	0.000
	Lower Group	3.521	1.038		
14	Upper Group	2.000	0.904	5.543	0.006
	Lower Group	3.260	1.096		
15	Upper Group	2.217	0.671	6.051	0.000

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

	Lower Group	3.869	1.289		
16	Upper Group	1.695	1.019	3.920	0.000
	Lower Group	4.416	0.668		
17	Upper Group	2.043	1.260	3.215	0.002
	Lower Group	3.304	1.184		
18	Upper Group	1.739	0.619	2.862	0.006
	Lower Group	3.043	1.260		
19	Upper Group	1.782	0.850	0.565	0.575
	Lower Group	3.086	1.378		
20	Upper Group	1.782	0.421	8.237	0.000
	Lower Group	3.434	1.471		
21	Upper Group	2.260	0.963	4.026	0.000
	Lower Group	3.260	1.321		
22	Upper Group	2.043	0.877	3.439	0.001
	Lower Group	3.086	1.083		
23	Upper Group	2.173	0.716	5.616	0.000
	Lower Group	3.521	0.994		
24	Upper Group	2.565	0.843	3.976	0.000
	Lower Group	2.565	1.079		
25	Upper Group	1.826	0.650	4.338	0.000
	Lower Group	3.217	1.166		
26	Upper Group	2.565	0.945	3.200	0.003
	Lower Group	3.304	1.145		
27	Upper Group	2.391	0.891	3.679	0.001
	Lower Group	2.565	1.273		
28	Upper Group	2.173	0.576	3.370	0.002
	Lower Group	3.521	1.201		
29	Upper Group	2.173	0.777	3.518	0.001

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

	Lower Group	3.521	1.038		
30	Upper Group	2.000	0.904	2.812	0.007
	Lower Group	3.260	1.096		
31	Upper Group	2.217	0.671	2.083	0.043
	Lower Group	3.869	1.289		
32	Upper Group	1.695	1.019	3.016	0.004
	Lower Group	4.416	0.668		
33	Upper Group	2.043	1.260	3.342	0.002
	Lower Group	3.304	1.184		
34	Upper Group	1.739	0.619	4.517	0.000
	Lower Group	3.043	1.260		
35	Upper Group	1.782	0.850	5.298	0.000
	Lower Group	3.086	1.378		
36	Upper Group	2.260	0.963	6.340	0.000
	Lower Group	3.260	1.321		

*: Degrees of Freedom (df): 54, Significance Level (α): 0.05

B. The internal consistency coefficient (the relationship between the item score and the total score):

was utilized by the researcher through the simple correlation coefficient between the scale score and the item score for the 35 items. All items demonstrated internal consistency, as the Pearson correlation coefficient for each item exceeded the tabulated correlation value at the significance level of 0.05, with the exception of item 27. Consequently, 35 items remain for measuring competitive excellence, and Table 4 presents the results of the internal consistency coefficient for the competitive excellence measure.

Table 4. *Internal Consistency of the Competitive Excellence Scale*

Item No.	Correlation Coefficient	Error Level	Item No.	Correlation Coefficient	Error Level
1	0.517	0.000	19	0.695	0.000
2	0.428	0.000	20	0.435	0.000
3	0.617	0.000	21	0.628	0.000
4	0.671	0.000	22	0.449	0.000
5	0.706	0.000	23	0.728	0.000
6	0.661	0.000	24	0.498	0.000

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

7	0.312	0.003	25	0.289	0.007
8	0.558	0.000	26	0.462	0.000
9	0.393	0.000	27	0.123	0.264
10	0.570	0.000	28	0.463	0.000
11	0.687	0.000	29	0.490	0.000
12	0.755	0.000	30	0.387	0.000
13	0.625	0.000	31	0.470	0.000
14	0.548	0.000	32	0.611	0.000
15	0.280	0.009	33	0.594	0.000
16	0.222	0.040	34	0.506	0.000
17	0.571	0.000	35	0.407	0.000

The researcher applied the competitive excellence scale to a sample from the research population using a random method. The researcher distributed the scale to a sample consisting of 100 individuals, represented by administrators and trainers from the research community. After sorting the results of the scale, the researcher discarded 2 questionnaires due to incomplete responses, resulting in a main experimental sample of 98. The scale was distributed from Monday, March 20, 2023, to Thursday, March 23, 2024, and was statistically processed to extract the results.

Statistical Methods

The statistical data were processed using the software (SPSS).

Results

Table 5. *One-Sample t-test Results for Determining the Significance Level of the Competitive Excellence Scale among the Study Sample*

Rank	Domain	Score	Relative Importance	Mean	Median	Std. Deviation	Hypothetical Value	t-value	Sig.	Level
1	Strategic Planning	28.398	24.3%	3.549	28	5.944	24	7.324	0.000	Good
4	Performance Evaluation	20.510	17.6%	3.418	21	4.179	18	5.946	0.000	Good
5	Continuous Improvement and Administrative Development	19.663	16.8%	3.277	21	4.421	18	3.724	0.000	Moderate

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

3	Human and Material Resources Utilization	22.734	19.5%	3.247	23	4.316	21	3.979	0.000	Moderate
2	Creativity and Innovation	25.153	21.5%	3.593	26	4.801	21	8.562	0.000	Good
	Scale Total Score	116.450	---	3.425	118	19.881	102	7.200	0.000	Good

Discussion

It is evident from Table (5) that the competitive excellence scale is positioned at an average level, as the responses from the sample yielded a mean score of (116.45) with a standard deviation of (19.881), and a mean score of (3.425) against a hypothetical mean of (102). The calculated t-value reached (7.200) within a significance level of (0.000), indicating the rejection of the null hypothesis in favor of the alternative hypothesis. This suggests that the mean of the axis significantly differs from the hypothetical mean, being higher than the hypothetical mean at a commendable level. Furthermore, the strategic planning axis ranked first among the domains of the competitive excellence scale, followed by the creativity and innovation axis in second place, the human and material resource investment domain in third place, the performance evaluation domain in fourth place, and the continuous improvement and administrative development domain in fifth place (Fadel & Kadem, 2021).

Strategic planning is one of the key factors for competitive excellence among employees and belonging to sports clubs, based on manager leadership that encourages self-awareness, awareness from others and awareness regarding surroundings. This management leadership is based on being capable of taking decisions that are informed and sustainable, interacting with the team, as well as fostering a positive context within which to work. According to Asma Abdul Rahim, leadership is " the process of influencing either directly and/or indirectly the activities of an organized group in relationship to pre-determined goals" (Abdul Rahim, 1995). Administrative leadership supports strategic planning and serves as a motivator to employees through the creation of healthy work environment and acknowledging those who make contribution to the mission. Also, creativity and innovation help to improve both individual and collective performance by assessing strengths and weaknesses and focusing on their development. (Costersen & Voege, 2011:9-10) Indeed, conscious leadership promotes innovation and creative thinking through listening to and uplifting new ideas which corroborates with the

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

interactive theory that "innovation is a result of interaction between situations which invoke creativity or innovation and human skills able to interact with these situations. The function of leadership becomes the one that supports the group to realize its purposes by reacting opportunistically and mobilizing support in order to cope with particular problems related with the organization such as production, work patterns, or organizational climate" (Al-Qaryouti, 1997:142).

Moreover, the investment in human and material resources, effective communication with employees, listening to their problems, and providing appropriate solutions can enhance competitive excellence, foster teamwork, and develop team skills. Club management can build strong and effective teams and develop competitive strategies. Continuous improvement and administrative development necessitate that leadership is capable of formulating competitive strategies that enable the club to excel in sports competitions. Consequently, the results emerged in this manner and were logical.

Conclusions

4- The sports clubs in Iraqi Ministry of Interior have competitive excellence level to a good extent from employees point of views.

5- Sports clubs in the Iraqi Ministry of Interior have a good level of strategic planning in the competitive excellence vision from employees point-of-view.

6- The Iraqi ministry of the interior sports' clubs apply a role evaluation in competitive excellence context at an acceptable level according to its viewpoint for the employees.

7- All sports clubs affiliated the Iraqi Ministry of Interior have adopted an acceptable level of sustained improvement and administrative development in competitive excellence as perceived by employees.

8- The clubs of the Iraqi Ministry of Interior have a moderate investment in human and material resources as far as competitive excellence is concerned from the opinion of the employees.

9- The Iraqi Ministry of Interior sports clubs show a good degree of imagination and innovation within the context competitive excellence as seen by the staff.

Recommendations

1. It is essential to activate competitive excellence and emphasize its practical application within sports clubs and institutions, in order to achieve leadership and maintain a leading position among competing clubs.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2. The management of these Iraqi sports clubs must enhance the areas that received average ratings and work towards their development and growth.
3. The management of Iraqi sports clubs should engage their personnel in advanced developmental and educational courses, with the aim of elevating their competencies and professional skills, as well as keeping them informed about the latest advancements in the field of distinguished sports management.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The relationship between decision-making time and accuracy of jump shooting among students at the college of physical education and Sports Sciences in handball

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Abstract

The study aimed to analyze the nature of the relationship between decision-making time and the accuracy of shooting by jumping among handball players who are students of the fourth stage at the College of Physical Education and Sport Sciences to reveal the extent to which cognitive-motor ability contributes to improving offensive skill performance. The study adopted a descriptive approach using the method of relational relationships, and 20 players who were selected deliberately participated. The study used a reaction time system to measure decision time, as well as test the accuracy of shooting from jumping from three specific points within the attack area. The results showed that the Arithmetic mean decision time was 0.828 seconds, while the Arithmetic mean successful shooting attempts from the jump shooting were 69.24out of 10. Statistical processing also revealed a statistically significant negative correlation between the two variables of r = -0.84, indicating that the lower the decision time, the higher the shooting accuracy from jumping. These results indicate that the higher the player's possessed speed in analyzing the situation and making decisions, this was directly reflected in a more accurate ability to direct the ball while jumping, which is consistent with the principles of sensorimotor perception and the theory of information processing in sports performance. The study recommends the need to integrate special training to reduce decision-making time into training programs for attackers, such as changing attitudes, visual and auditory response exercises, as well as the use of electronic measuring devices to enhance skill development. He also recommends future studies that address other psychomotor variables such as selective attention and motor prediction speed to develop the performance of offensive positions in handball.

Keywords: Handball, Decision Time, Shooting Accuracy, Jumping in Handball.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Handball is one of the fast team games characterized by the complexity of offensive and defensive situations, the constant need to make accurate decisions under the pressure of time and space. The effectiveness of an offensive performance in handball depends on the ability to read the situation. choose the appropriate response and then execute it kinetically within milliseconds. This dynamic nature makes cognitive abilities especially decision time a central element in explaining the differences between outstanding players and less experienced players especially in offensive situations that require the speed of forecasting and determining game variables such as the positions of defender's goal angles and timing of jumping and shooting. The shooting skill from the jump is the cornerstone in the construction of the modern attack in handball since it represents the most widely used and effective offensive means of scoring. This skill is based on the fusion of physical elements (explosive power, elevation, and arm speed) with technical elements (launch angle, ball control, and timing of leaving the ground) as well as cognitive elements, most notably the ability to make a quick decision at the critical moment before shooting. Since shooting from the jump is the most popular and successful attacking strategy for scoring, it forms the basis of contemporary handball attacks. This ability is based on a combination of technical (angle of release, ball control, timing of leaving the ground), physical (explosive power, elevation, arm speed), and cognitive (most notably, the capacity to make fast decisions at the crucial moment before shooting) factors. A player's shooting is not only a mechanical movement but a series of sequential decisions, such as choosing the shooting point, determining the moment when he should leave the ground, and predicting the direction of the goalkeeper's and defense's movement. Skill accuracy can no longer be studied in isolation from cognitive processes, as modern models of motor learning suggest an organic relationship between cognitive decisions and motor outcomes. Decision time is the time between the player's reception of the stimulus (such as the appearance of a gap in the defense or the movement of the goalkeeper) and the moment when the executive action begins. The faster a player filters out unimportant information and pick out crucial information, the more capable they are of choosing an effective offensive response. According to the Perception-Action Theory, the quality of a decision is inseparable from the quality of execution, because both belong to a single system that interacts with the environment moment by moment. The importance of this cognitive variable is even more pronounced among attacking center players, who bear the bulk of the responsibility for finishing attacks and face closed and complex playing situations that require a quick reading of defenders' positions and identifying the ideal moment to jump over the defender's shoulder and aim at the far or near corner. In every shot attempt, the attacking player goes through a series of rapid mental processes, starting with selective attention to stimuli, followed by motor perception, decision-making, and finally the execution of the shot. This series is often less than a second, so a slight delay in decision time can mean a

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

definite scoring opportunity. The second variable in the research, which is the accuracy of shooting from the jump, is one of the most used indicators in evaluating an offensive player's efficiency. Precision is the result of the interaction of several systems: the neuromuscular system, the cognitive system, the visual system, and the motor rhythm. Therefore, a decrease in shooting accuracy does not necessarily indicate a weakness in technique but may indicate a delay in situational perception, a miscalculation of variables such as distance or angle of throwing, or slow decision-making during defensive pressure. In the university environment and among students of the College of Physical Education and Sport Sciences, this problem is clearly prominent: most students possess basic skills in handball, but they often suffer from a weakness in "situational cognitive processes" that are not sufficiently focused in traditional training. This makes the study of the relationship between decision-making time and the accuracy of shooting from the jump of great scientific and practical importance, especially in the development of training curricula aimed at integrating cognitive training with skill training. By reviewing the recent sports literature, it is clear that many studies have unanimously agreed on the crucial role of speed decision-making in the success of offensive skills in team games such as football, handball, and basketball. However, studies linking this variable specifically to the shooting skill of attacking center players are still few, which is a knowledge gap worth studying. This confirms the need to conduct field research that clarifies the nature of this relationship among the students of the College of Physical Education and Sport Sciences to form scientific data on which to build in the development of training and teaching methods.

Problem of Study

Through the researcher's field experience in teaching handball and his observation of the level of performance of the students of the College of Physical Education and Sport Sciences in the skill of shooting from jumping, it was found that there is a clear disparity in the accuracy of execution among the players of despite the similarity of their basic physical and skill levels. This disparity raised a practical and scientific question about the cognitive/cognitive factors affecting skill performance, especially the time of decision-making, which is considered one of the decisive mental abilities in team games with changing and fast situations (Lenzen, Theunissen, & Cloes, 2009). Studies show that the quality of decisions in play situations is based on the player's ability to pick up and act on visual and motor stimuli over short periods of time, and that differences between the distinct and non-distinct are seen in both decision-making speed and motor response accuracy (Mann et al., 2007). Systematic reviews and studies specialized in handball have also shown that the study of perception-action coupling is essential to understand shooting behaviors and the effectiveness of finishing attacks, and that current research rarely directly links decision time to the accuracy of shooting from jumping offensive position players (Bonnet et al., 2020). On the other hand, analyses of the biomechanical dimension of jump

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

shooting show that kinetic variables (e.g., hand speed, jump height, and shooting angle) affect shooting accuracy, but final performance is the product of a complex interaction between biomechanical structures and perceptual decisions made under the pressure of time and space (Belčić et al., 2023). Furthermore, Quiet Eye research suggests that shooters and shooting experts have visual focus and cognitive initiative-taking patterns that increase execution accuracy and reduce response time in defensive pressure situations (Vickers, 2019). Based on these theoretical and applied data, and with the lack of field studies that have dealt with the direct relationship between decision-making time and the accuracy of shooting from jumping among attacking center players in a university student environment, a knowledge gap is clear that requires field research. Therefore, the research problem is determined in the following question: Is there a statistically significant correlation between the time of decision-making and the accuracy of shooting performance from the jump among the players in handball who are students of the College of Physical Education and Sport Sciences?

purpose of the study

- Measuring the decision-making time of the players in handball who are students of the College of Physical Education and Sport Sciences.
- Measuring the accuracy of shooting from jumping in the research sample.
- Determine the nature of the relationship between decision time and the accuracy of shooting from the jump.
- Explain how speed of decision affects the executive level of the attack. Provide training recommendations to improve offensive performance.

Study Hypotheses

There is a statistically significant correlation between decision-making time and the accuracy of shooting performance from jumping among the attacking center players in handball who are students of the College of Physical Education and Sport Sciences.

Methodology

The researcher adopted the descriptive approach of relational relations to suit the nature of the problem, as this method aims to reveal the nature of the relationship between variables as they appear in reality without interfering with their modification, and it is one of the most used approaches in research that studies cognitive motor phenomena in students and players (Creswell & Creswell, 2017; Thomas et al., 2015).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Participants

The research sample consisted of 20 students from the fourth stage at the College of Physical Education and Sport Sciences/University of Baghdad for the academic year 2024-2025, and they were selected by the deliberate sample method, as they represent the most appropriate educational category to test the relationship between decision-making time and shooting accuracy from jumping in the players in handball. The student is enrolled in the fourth stage and has completed practical and theoretical handball courses during the years of study, free of muscular or joint injuries that affect jumping or shooting. The sample was selected according to specific criteria to ensure accurate representation of the indigenous community and to maintain consistency and objectivity in measuring the variables under study. These criteria included the student being enrolled in the fourth stage having completed practical and theoretical handball courses during the study years and being free of muscle or joint injuries affecting jumping or shooting. These criteria are aimed at ensuring a sufficient level of motor cognitive and sensory skills necessary to accurately and reliably conduct target tests and are also consistent with literature recommendations confirming the need to standardize the level of experience when testing cognitive skill variables in team games (bonnet et al., 2020; Mann et al., 2007). The initial sample underwent a purification process to verify the integrity of the data and exclude situations that may affect the reliability of the results. The purification process included the exclusion of some students for reasons of commitment or ability to take tests such as non-compliance with attendance during lectures the presence of temporary shoulder or knee injuries that impede jumping or arm movement and non-compliance with instructions during measurement procedures which affect the accuracy of the data. After the purification process the final sample was fixed on 20 students, a size suitable for statistical analysis procedures related to correlation relationships and consistent with what the scientific research literature in physical education indicated about the adequacy of small and medium samples in studies of motor and cognitive skills (Creswell and Creswell, 2017; Thomas et al., 2015). The unification of the educational and training environment of fourth-stage students reduced the impact of uncontrolled environmental factors which enhances the accuracy of the results and makes it possible to generalize them to similar categories of students of the faculties of physical education and sports science (Belčić et al., 2023).

The study tests

In this study the researcher relied on a set of scientific tools and tests aimed at measuring the two main variables of the study namely the decision-making time and the accuracy of aiming from the jump of handball players. These tools were selected based on methodological grounds consistent with the recommendations of modern literature in the field of motor perception and aimed at group games (Mann et al., 2007; bonnet et al., 2020; Belčić et al., 2023).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The researcher of this section relied on an accurate description of the procedures ensuring the re-implementation of the study in similar environments achieving the conditions of constancy and truthfulness in skill and cognitive tests in the sports field.

First: decision time Test (decision time Test)

Test description

To measure the decision-making time the researcher used an electronic program for viewing visual-motor stimuli based on a simple reaction time and selection model which is used in perceptual-motor studies to assess the speed of response and decision-making under various conditions of visual stimulation. A set of symbols or colors was displayed on the computer screen the student was asked to make the right decision based on the predetermined stimulus press the corresponding response Button and record the time between the appearance of the alarm and the response. This procedure is similar to that proposed by Vickers (2019) Williams and Ford (2008) in studies of mathematical cognition.

Testing Supplies & Instruments

- A laptop with Reaction Time software installed.
- Highly sensitive response pad.
- A quiet lab environment inside the skills lab or one of the closed rooms.
- Data Registration Forms.

Testing Procedures

- The student sits in front of a screen at a distance of 60 to 70 cm.
- The stimulus to respond to is explained (e.g., the appearance of a red color among multiple colors).
- The program features 20 attempts per student.
- The program records the time in milliseconds for each attempt.
- The arithmetic average of the decision-making time for each student is calculated.

Scientific basis of the test

This method is based on the perception-action coupling models used to measure the speed of decision-making in team games.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Several studies have confirmed that decision tests based on visual responses are a reliable indicator of decision speed in high-tempo games such as handball.

Second: Test the accuracy of shooting from jumping.

Test Description

To measure the accuracy of shooting from jumping, the researcher used a field test based on international models for the study of shooting in handball, specifically the Jump Shot Accuracy Protocol test used in several recent studies, including a study (Belčić et al., 2023). The test involves the player shooting the ball while jumping from a distance of 7 meters towards a goal divided into numerical squares to determine accuracy.

Testing Supplies & Instruments

- A standard handball goal. Divide the goal into 9 squares using colored ribbons. 20
- Standard handball.
- Camera or shooting accuracy tracker (optional to enhance analysis).
- Measuring ruler, floor bar, and jump area fasteners.

Testing Procedures

The student stands behind the 9-meter line and starts rushing with offensive steps that resemble a real attack.

Performs a standard offensive jump towards the shooting point.

The student performs 10 attempts to aim at the goal.

The location of the falling ball is recorded inside the squares.

The accuracy is calculated according to the following table:

• Lateral upper squares injury: 3 points

• Middle squares injury: 2 points

• Lower squares injury: 1 point

The total points are calculated as the value of accuracy for each player.

Statistical Methods

- Arithmetic average.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Standard deviation.
- Pearson simple correlation coefficient.
- Significance analysis of the results (significance $\alpha \leq 0.05$).

Result

Table 1. ***shows the arithmetic averages, standard deviations, and correlation coefficient between decision time and jump shooting accuracy***

Variable	M	SD	r	(p-value)
Decision Time	0.828	0.106	-0.84	<0.001
Accuracy of shooting from jumping	69.24	5.12		

Table (1) shows the descriptive statistics and the analysis of the correlation between the study variables, namely: Decision Making Time and shooting accuracy from jumping among players in handball students of the College of Physical Education and Sport Sciences. The results of the analysis showed that the average decision time was 0.828 seconds with a standard deviation of 0.106, which indicates that there is a slight difference in the speed of the players when making decisions during attack situations. As for the accuracy of shooting from the jump it averaged (69.24 %) with a standard deviation (5.12) reflecting relatively stable performance among players. As some of them tend to achieve higher accuracy of shooting than others during the jump. As for the correlation relationships between the variables. the results showed a strong negative correlation and a statistically significant function between the time of decision-making and the accuracy of shooting from jumping ($R = -0.84$, $p < 0.001$), which means that players with a shorter decision-making time managed to achieve higher accuracy of shooting from jumping ($R = -0.84$, $p < 0.001$), which means that players with a shorter decision-making time were able to achieve higher shooting accuracy from jumping. Regarding correlation relationships between variables: The results showed a strong negative and statistically significant correlation between decision time and jump shooting accuracy ($r = -0.84$, $p < 0.001$), which means that players with shorter decision times were able to achieve higher shooting accuracy than jumping. This suggests that decision-making speed is a significant factor in improving shooting performance, as the player who is quicker to make decisions can aim the ball with higher accuracy towards the target during attack. These results support previous hypotheses in the field of sports psychology, which suggest that reducing the cognitive processing time of field situations increases the effectiveness and accuracy of skill performance in dynamic and open sports such as handball, especially in attacking

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

situations from jumping that require high coordination between motor perception and quick decision-making.

Discussion

The results of this study showed that there was a strong and statistically significant negative correlation between decision-making time and shooting accuracy from jumping among the players in handball who were students of the College of Physical Education and Sport Sciences, where the correlation coefficient was ($r = 0.84$, $p < 0.001$). This result indicates that the less time a player has to make decisions, i.e., the faster he is able to process information and make his decisions, the more accurate he will be in shooting while jumping. These indicate The relationship focuses on the pivotal role that cognitive competence and mental processing play in the performance of fine motor skills in dynamic play situations, including proper jump timing, body balance through the air, directing the ball toward the goal, and interaction with multiple field variables such as the position of the defender and teammates. The average decision time in the sample (0.828 seconds) and Arithmetic mean shooting accuracy (69.24%) reflect individual differences between players in cognitive and motor abilities, confirming that some players possess high cognitive speed associated with greater executive accuracy. These results are consistent with what (singer, 2001) indicated, that the speed of decision-making under temporal and spatial stress is a crucial skill in interactive sports because athletes with a high ability to quickly process situations are more efficient in adapting to fast-playing situations and achieving accurate skill performance (singer, 2001). Many studies have also confirmed that players with an advanced ability to anticipate opponents' movements and make a quick decision show more accurate and effective performance. From an educational and applied point of view these results can be explained by the characteristics of the study sample since undergraduates often have a good knowledge base but their practical competitive experience may be limited which leads to unevenness in cognitive and motor competence. Previous studies have shown that students who have not undergone intensive training in interactive game situations are slower in decision-making and less accurate in performance reflecting the role of continuous and intensive training in the development of cognitive abilities associated with motor skills. Thus it seems that the decision-making time is not a secondary variable but a major determinant of performance because the players who recorded more time in decision-making were themselves the least accurate which indicates the importance of rapid information processing selective attention and motor readiness in the performance of the skill (Williams, 2008). The practical implications of these results are also evident in sports training as they indicate the need to integrate cognitive and cognitive training programs within motor skills classes, which enhance the speed of decision-making and the anticipation of motor reactions. It is advisable to design exercises that simulate realistic playing situations including jumping and aiming under the pressure of defenders or in a changing environment to improve the interaction of perception

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

decision-making, and motor execution at the same time. Recent studies show that joint exercises combining cognitive and skill aspects contribute to improved performance within matches more than exercises focused on physical skill alone (Zhu, 2024) and neurological studies confirm that more experienced players show faster and more efficient neurological responses when making a decision which translates into higher accuracy in the implementation of skills under the pressure of the match (Xiong, 2024). Therefore the results of this study suggest that improving decision-making time through cognitive exercises and realistic interactive exercises can lead to increased aiming accuracy from jumping, as well as enhance the ability of players to adapt to fast and complex game situations. In theory the study adds evidence that skill performance in team sports is based on an integrated interaction of mental abilities, tactical knowledge and physical skills, which opens the way for the development of comprehensive training programs that take into account the mental physiological and motor aspects of players enhancing the effectiveness of performance within matches.

Conclusions

The study showed a statistically significant and strong negative correlation between the decision-making time and the accuracy of shooting from the jump in handball players showing that the speed of decision-making is a decisive factor in improving the accuracy of skill performance. The results revealed that faster decision-making players achieved higher aiming accuracy, while longer decision-making time was associated with lower accuracy confirming the important role of cognitive processing and selective attention in complex motor skills. The study indicates that there are individual differences between the players in cognitive and motor abilities, since the difference in the speed of decision-making is directly reflected in the efficiency of the implementation of shooting skills from jumping. The results confirm the importance of integrating cognitive and skill aspects in the development of sports performance in open-ended team sports such as handball, enhancing the ability of players to adapt to changing and complex playing situations.

Recommendations

Integration of cognitive and skill training: it is advisable to include exercises to develop processing speed and decision-making within the skill training programs of handball players to promote harmony between perception and motor execution.

Design exercises to simulate realistic play: training situations should be diversified to include elements of temporal and spatial pressure, such as the presence of defenders or sudden changes in the position of the ball, to enhance the ability of players to make quick and accurate decisions in actual matches.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Periodic assessment of decision time and accuracy of aiming: it is recommended to periodically use tests of decision time and shooting skills to monitor progress and identify players who need additional cognitive or skill support.

Develop comprehensive training programs: programs should be designed that link the cognitive aspect, tactical experience, and physical skills to improve performance on the field in an integrated manner.

Individual training according to cognitive abilities: it is recommended to identify individual differences in decision-making speed between players and design training activities tailored to support players with lower cognitive speed, to enhance the chances of achieving optimal performance for all team members.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The Effect of Plyo-agility Exercises on Improving agility and Developing Defensive Tracking ability in Basketball players Under 18 Years of Age

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Abstract

The purpose of this research is to show analysis about the effect of plyo-agility drills on agility and defensive rebound in under 18 female basketball players. It evaluates the effectiveness of such exercises for enhancing defensive speed and reactive agility. A pre-post with experiment group design tested the effects of exercise on 12 players from Al-Hilla Basketball Club through 24 sessions for 8 weeks. finding the agility time decreased from 12.5 to 8.25 sec indicating superior speed and reaction. Defensive rebounding repetition count was 17.17-24.17 showed a higher defensive reaction. In contrast, plyo-agility training markedly improves agility and defensive performance of volleyball players. It is recommended to integrate regularly and progressively these tasks into the training process of young players, to gradually increase their intensity, and to train on a cyclic basis for the maintenance of improvements.

Keywords: Plyo-Agility exercises, agility, defensive rebounding, basketball, under 18 age group.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Introduction

Agility is a basketball skill, and since the floor can change shape as inexplicably as a dream while the teams scuttle up and down it screaming to their enemies in quick bursts of gunfire, say, or something like that athletes have to be ready for any new reality they find themselves involved with. But there's a long of a lot more to getting faster than just training the way you always do and being able to change direction (COD) and out-cut some on defense. When it comes to the improvement of these skills, a lot of experts say that what athletes need to do is run agility drills paired with short bursts of explosive activities such as plyometrics to improve their basketball playing ability. Plyo-agility is an explosive combination of plyometric and agility training working to allow the athlete to move in one direction, make a split-second change and move again with great body control. This force-velocity profile is associated with enhancement of physical performance in team sports. Plyometric and agility training could help improve a basketball player's ability to grab that elusive basketball rebound on defense, new research suggests. It does enhance foot quickness, lateral slides and speed into defensive rebounding. These are the same factors that drive a game team's defense. Plyo-agility training is a recent training program that combines plyometric and agility training together, leading to the potential of improving the performance skills in youth players (U18).

The purpose of this study is to examine the effects of plyo-agility exercises on the agility and defensive rebounding ability in basketball players under 18. It is also intended to study how these drills influence the players' defensive physical performance, particularly running with and without change of direction into its high speed demand. Examining such effects may help in designing training programs which are more effective that improve players exposure.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Agility and cutting ability are the most important parameters to determine player performance in team sports, such as basketball. This is a sport that requires athletes to execute sharp, powerful moves on the court in order to keep up with an opponent's offensive and defensive plays – while some would argue at equally high levels. With the growing competition and evolution of team tactics, being able to respond more rapidly to defensive situations has become a necessity, especially among young players such as basketball under-18. But despite the significance of having agility and being able to change direction in an instant, not many coaches was successful in finding a solid training program that they could pass along to their younger players. Traditional conditioning may not have a great influence on defensive power production and little is known about the combination of plyometric and agility drill effects in improving basketball defensive capability. Thus, the problem is that it is necessary to determine if there is plyo-agility training to improve agility and defensive follow-through in those young players.

The main question

Can plyo-agility exercises improve the agility of basketball players under 18, and increase their ability to develop defensive rebounding by improving the speed of change of direction?

Purpose The purpose of this study is to examine the effects of plyo-agility exercises on agility and defensive rebound performance in under-18 years old basketball players. It is also intended to assess how these drills influence the players' defensive physical capacity - more particularly CS – and his ability to change direction in high velocity. The investigation of these effects can aid in designing better training programs to improve athletes' performance against such game-specific situations.

Research objectives

1. To identify the impact of plyo-agility exercises on improving the agility of basketball players under 18 years of age.
2. To identify the impact of plyo-agility exercises on defensive rebounding in basketball players under 18 years of age.

Research hypotheses

1. There is a statistically significant difference between the pre-test and post-test in improving agility in basketball players under 18 years of age.
2. There is a statistically significant difference between the pre-test and post-test in developing defensive rebounding in basketball players under 18 years of age.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Methodology

The researcher used the experimental method with an equivalent group design due to its suitability to the nature of the research problem. The experimental method is one of the approaches that helps solve some problems related to experimental research in a scientific manner, especially in the field of physical education, due to its rigorous scientific approach within the methods related to scientific research.

Population and Sample

The research population consists of basketball players under the age of 18, specifically players from sports clubs that focus on developing the physical and tactical skills of young players. The ages of the club players in this research range from 18 years and under, which is the age range in which physical skills specific to basketball improve, such as agility, changing direction, and quick reactions to defensive and offensive situations in games. This age is considered suitable for developing skills that contribute to improving defensive rebounding and agility in basketball.

The research sample was selected from 12 players from Al-Hilla Basketball Club under the age of 18 using purposive sampling. This sample was selected with the aim of applying Plyo-Agility (plyometric-agile training) exercises to improve their motor skills, including defensive follow-up. Who were chosen intentionally and then randomly distributed using the method of drawing lots into two equivalent groups, experimental and control, with (5) players in each group.

Table 1. *Anthropometric measurements*

Measurements	Arithmetic mean	standard deviation	Torsion coefficient	median
Height (cm)	174.08	5.02	-0.28	74.5
Weight (kg)	71.00	5.66	-0.32	1.5
Age (years)	16.50	1.00	0.00	6.5
Training Age (years)	2.17	0.94	0.41	.0

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Devices and Tools Used

Equipment and Methods Used in the Research: Data Collection Methods Tools and Equipment Used and Data Collection Methods

Research Tools

1. Basketball court.
2. Stopwatch.
3. Basketballs (25)
4. Measuring tape (2)
5. Whistles (4)

Equipment Used

Weight Scale

A digital scale is used to accurately measure the players' weight. Weight measurement helps in analyzing the relationship between weight and agility, as ideal weight contributes to improved physical performance.

Height Measurement

Height is measured using a height measuring device (such as a medical tape measure or an electronic height measuring device) to track height development and analyze its relationship to performance in plyo-agility exercises.

Training Cones

Training cones were used to define the paths that players should follow during rapid direction change drills. This helps measure players' ability to quickly steer and react to real-time path changes.

Speed Steps or Hurdles

Low hurdles or steps were used to train speed of movement. This type of exercise enhances players' ability to change direction quickly and is a component of agility training.

Statistical Analysis Software

SPSS software was used to analyze the statistical data resulting from the sports tests and exercises. The program helps calculate arithmetic means, standard deviation, median, and skewness coefficient for all player-related data (such as height, weight, age, and training age).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Methods of Data Collection

1- Arabic and foreign sources.

2- Tests.

Tests Used in the Research

Agility Test

Among the various tests for measuring agility, the T-Drill test is one of the most widely used in many sports, including basketball, to measure the ability to change direction quickly. This test relies on the player's ability to move quickly and efficiently in a range of different directions.

T-Drill Agility Test

Objective of the Test

This test is designed to assess reaction time and agility, which are key components in basketball, especially on defense by reacting to loose balls and making quick slides.

Required Equipment

- 4 training cones.
- 10-meter distance: The cones are placed 10 meters apart in a "T" shape.

Objective of the Test

The purpose of this test is to assess reaction time and also the ability to change direction, skills that are required in basketball, for example when defending being able to keep track of a quickly responsive attacker.

Required Equipment

- 4 training cones.
- 10-meter distance: The cones are placed 10 meters apart in a "T" shape.

Procedure

1. Four cones are placed on the ground with a distance of 10 meters between the top and bottom cones, and a distance of 5 meters between the two horizontal cones.

2. The player starts at the bottom right corner of the apparatus (Point A).

3. The player begins running in a straight line towards the top cone.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

4. Upon reaching the top, the player quickly switches to the right side (Point B), then to the left side (Point C), and finally returns quickly to the starting point.

5. The time it takes the player to complete this route is recorded.

Score Calculation

- The score is the time it takes the player to complete the route.
- For example, if the player takes 12.3 seconds to complete the test, the score will be 12.3 seconds.

Test Name: Defensive Follow-Up

(1) The test has been modified by giving the player one attempt and allowing the player (12) touches of the ball, with the time taken during each touch being recorded.

Test Objective: To measure speed and accuracy in retrieving rebounds in defense.

Required Equipment: Basketball hoop, basketball, timer

Playing Procedure: The player stands 3 meters from the hoop, which has a line drawn parallel to the ground at a height of 3 meters. The player throws the ball with both hands or one hand towards the hoop and over this line, then steps forward to catch the rebound and returns to the starting line. This process is repeated for 60 seconds.

Exploratory experiment

Pilot study is a prerequisite in scientific research, as it enables the researcher to identify problems that might occur during the larger study procedures. Based on the recorded observations, necessary corrections could be performed to make sure that results were trustworthy and method was good.

The researcher conducted a pilot study on a sample of four players from Al-Karkh Club on February 1, 2025. The objectives of the pilot study were:

1. To test the measurement tools: To ensure the accuracy of the tools used in data collection.

2. To examine the research design: To ensure that the chosen research method is suitable for data collection and analysis.

3. To analyze influencing variables: To identify factors that may affect the main experiment and that need to be controlled.

4. To improve procedures: To refine the methodology and practical steps in the research based on the collected observations.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

5. To gather preliminary observations: To identify any problems or difficulties that the researcher may encounter during the experiment.

Pre-testing

This is a trial that is run to see how the tests are reacted to by the target group. By pre-testing, time and cost is saved by ensuring that the target population comprehends the tests that are to be conducted.

The researcher conducted the pre-tests on February 7, 2025, at 10:00 AM.

Exercises

- **Number of training units**: 24 training units.
- **Duration**: 8 weeks.
- **Number of training sessions per week**: 3 sessions per week.
- **Main objective**: To improve agility and the ability to react quickly in defensive follow-up using advanced exercises.

Phase 1: Preparation (Weeks 1-2)

Objective: Improve flexibility and core strength.

• Adapt to simple agility exercises.

Training Units:

1. Unit 1:

Squat Jumps: 3 sets of 10 repetitions.

Bodyweight Squats: 3 sets of 15 repetitions.

Basic Balance Exercises: 3 sets of 30 seconds.

2. Unit 2:

Agility Ladder: 3 sets of 20 meters.

ZigZag: 3 sets of 20 meters.

Small Hurdle Jumps: 3 sets of 10 repetitions.

3. Unit 3

T-Drill: 3 sets of 5 repetitions.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Small Hurdle Jumps: 3 sets of 12 repetitions. Training intensity: ● At this stage, the focus is on getting used to the nature of the exercise and how to move.

Phase Two: Development (Weeks 3-4)

Objective

● Improve the ability to change direction quickly.

● Develop defensive follow-up in basketball situations.

Training Units

4. Unit 4

● Plyo-Agility Exercises (Stair Movement): 3 sets x 10 meters.

● High Hurdle Jumps: 3 sets x 10 repetitions.

● Sprinting with a sudden change of direction between cones: 3 sets x 15 meters.

5. Unit 5

● Defensive Slide Exercises with Footwork: 3 sets x 15 meters.

● Seated Jumps: 3 sets x 12 repetitions.

● Defensive Coverage: 3 sets x 20 meters.

6. Unit 6

● Cone Drills (Quick Change of Direction): 3 sets x 20 meters.

• Sprint running with changes of direction across cones: 3 sets x 20 meters.

• Jumping drill with defensive aiming: 3 sets x 10 repetitions.

Training Intensity

● Sub-maximal intensity, with increased speed and difficulty.

Phase 3: Improvement (Weeks 5-6)

Objective

● Enhance defensive tracking and speed.

● Improve the ability to react to an opponent.

Training Units

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Unit 7

● Zig-Zag Agility (Quick Change of Direction): 4 sets x 20 meters.

● Defensive Tracking Against a Moving Opponent: 4 sets x 15 meters.

● Sprinting with Defensive Reaction: 4 sets x 20 meters.

8. Unit 8

Advanced Hurdles: 4 sets of 12 repetitions.

Sprint and Return: 4 sets of 15 meters.

Defensive Pursuit with Rebound Pass: 3 sets of 15 meters.

9. Unit 9

Plyo-Agility Test with Shooting: 4 sets of 20 meters.

Defensive Pursuit with Quick Reaction to Basketball: 4 sets of 15 meters.

Repetition of Defensive Moves in Near-Game Conditions: 4 sets of 5 minutes.

Training Intensity: Submaximal Intensity: Focusing on increasing the speed and accuracy of defensive moves.

Phase Four: Mastery (Weeks 7-8)

Objective

Improving defensive reaction under time pressure.

Improving overall defensive follow-up in various situations.

Training Units

10. Unit 10

• Advanced drills for changing direction under time pressure: 4 sets x 30 meters.

• Defensive pursuit drill throughout the game: 5 sets x 15 meters.

• Agility drills aimed at increasing accuracy: 4 sets x 20 meters.

11. Unit 11

• Shadow Defense drill: 4 sets x 20 meters.

• Sprint running with defensive reaction under match conditions: 4 sets x 20 meters.

• Defensive drill with quick substitutions: 5 sets x 15 meters.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

12. Unit 12

Mini-defensive match with quick reaction: 5 sets x 5 minutes.

Continuous defensive pursuit with rapid changes of direction: 4 sets x 20 meters.

● Running with bounce passes under pressure: 4 sets x 15 meters.

Post-Tests

The post-test is one of the tests that trainees take upon completion of the training program to ensure the achievement of the research objectives.After the training modules were implemented, the post-tests were conducted for the research sample on April 7, 2025.The post-tests were conducted under the same conditions as the pre-tests in terms of time, tools, and testing location.

Statistical Methods

Statistical methods are defined as the data that the researcher collects and analyzes to obtain results that help solve the research problem.

The researcher used the Statistical Package for the Social Sciences (SPSS) and some statistical methods to process the research data, namely:

1. Arithmetic mean
2. Standard deviation
3. T-test for paired samples

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Results

Table 2. *Arithmetic means, standard deviations, calculated t-value, and significance of differences for the experimental group in the pre- and post-test results of the skills tests*

Tests	Unit of Measurement	Pre-test		Post-test		F	p	(T) Calculated	Significance
		S	± A	S	± A				
Agility	Th	12.5	1.17	8.25	0.75	4.25	1.71	-8.60	0.000
Defensive follow-up	repetition	17.17	0.94	24.17	0.94	7.00	1.014	7.26	0.000

The value of (t) is significant ≤ 0.05 at degrees of freedom (11)

Discussion

The researcher explains this development by a more pronounced ability of the players to process defensive situations faster and more reliable. This advancement means that the players have been more successful in defensive rebound and fast break from.

Plyo-agility drills are not only for speed, increasing a player's ability to react quicker to any movement in the game thereby improving defensive play. This improvement is related to being able to move faster and react more quickly to the opponent, crucial for basketball. In addition, better reactions are part of the neuromuscular adaptation to task-specific training in defending strokes and will make the player faster also have a stronger pattern off movement all over their court.

An additional study by Caprić (2022) demonstrates that plyometric exercises not only increase agility but also help with defensive rebounding by developing an explosive first step and ability to attack the opponent quicker. Intensive defensive rebounding appeared to improve the reaction speed and fight against basketball attack (Hussein & Amin, 2020), which is consistent with our test.

The increases in agility and defensive rebounding are also, it should be said, products of the physical changes to muscles and nerve tissue's pathways when the same exercise is undertaken regularly. Fast-twitch muscles are activated via plyometric exercises like jumps and zigzag runs, which help build explosiveness for speed and agility. Over time, these exercises improve muscle oxygenation, increase endurance and become more responsive to changes in the game.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Likewise, you need some neuroplasticity – give your players a supple enough nervous system and they will be able to perform more complex actions and do so faster which was brought out in the tests where players got better.

On basketball, the rapid mobility and defense-follow up can not only help you advance the entire game performance. Agility is not only turning quickly, it's reaction to the opponent, covering space quickly and being part of a dynamic situation in the game. However, you should also train defensive reaction and plyo-agility drills that improve those components as well, which will up your athletic game.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Conclusions

1. Plyo-Agility training had a strong positive effect on agility of basketball players. Test time reduced from pre-test (12.5 s) to post-test (8.25 s), suggesting that the athletes were better able to respond rapidly to changes in direction during game play.
2. The findings revealed that the number of defensive rebounds per player has significantly enhanced from 17.17 to 24.17 due, while the rebounders are better to trap their opponent quickly simultaneously.
3. Fast, forward-focused responding and complete coverage of the court have helped to improve defensive skills while also allowing players to chase after their opponents more effectively.
4. The level of improvement was significant statistically in both tests ($p < 0.05$) which means that the players had a significantly improved performance and it is not due to chance but to intensive practice.
5. Hyperfolic feeding during the whole training cycle became pivotal in improving their physical status. The end of phase intensity was very high (80%-90 %) which significantly elevated players' strength to tolerate pressure and also contributed changes in some aspects of their defense.
6. It is recommended to continue plyo-agility training as a core component of basketball players' training programs, as it has proven effective in improving agility and defensive performance. Combining plyometric and agility exercises can be key to enhancing overall performance.
7. It is recommended that one steadily raise the intensity of training over the course of the training season as high-intensity in late stages has led to impact performance positively. It is necessary to modulate the intensity of training according to the players' stage of development.
8. For defense, you should have at least drills working on getting to your opponent quickly (reaction time) and being able to get back in the play up the court; because these are basing foundation skills of basketball. Teaching defensive players the angles of pursuit and rapid change of direction situations in a game setting helps them maintain tempo with their opponent.
9. Periodic agility and defensive tracking tests are needed. These will act as a kind of ongoing progress indicator and hard evidence that the training is effective.
10. It is advised to use drills that mimic game-like situations and the time pressured environments of a real game. These are drills that will improve the reaction time of your players and make them better defenders in crucial game situations.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

11. This technique could be applied in other basketball clubs especially with the youth categories, where agility and defensive movement skills might develop better interpretations to support an increased performance in forthcoming years.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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The effect of an educational approach according to the Schmuck model in testing cognitive information processing and learning some basic football skills for students

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Abstract

Advanced nations put a lot of effort into implementing different models, ideas, and instructional practices that help athletes reach greater heights in their chosen sports. They use contemporary methods to improve their physical and motor capacities, which helps them acquire skills for a variety of situations. The importance of research resides in testing and applying the strategies of the Schmach educational model as a legitimate scientific undertaking. The primary focus of the research is the uneven acquisition of fundamental football abilities among first-year students at Wasit University's College of Physical Education and Sports Sciences. The goal of the project is to create an educational program based on the Schmach model that will assess students' cognitive information processing and their acquisition of fundamental football abilities. It also aims to comprehend how the Schmach model-based instructional program affects students' cognitive information processing and their acquisition of fundamental football abilities. The findings show that the Schmach model-aligned educational program significantly and successfully improved pupils' ability to comprehend information. It is mentioned how the Schmach model-based instructional program improves two important abilities for which research has been done: ball control and scoring. The Schmach model must be incorporated into curricula for students at the College of Physical Education and Sports Sciences, according to recommendations.

Keywords: educational approach, football scoring skill, football control skill.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Introduction

Advanced countries in sports use many strategies, educational models and theories that contribute to bringing the athlete to the highest levels to achieve sports achievement in the specialized event. Many modern techniques have been used to improve mental and motor abilities that work to develop skills in various events.

Preparing an educational curriculum that helps students memorize and remember information and how to prepare for exams using an educational model represented by the Shamk model and the cognitive processing test to learn basic skills in football, as motor learning is one of the important sciences in the sports field and is directly related to the student's performance; This is because it is a set of mental processes that occur during exercise that help the student change his motor behavior, and that any development in any area of life that a person seeks to reach must invest all the possibilities and capabilities that are specific to that area to reach that development, so the teaching methods adopted by teachers and specialists in the sports field to reach the highest levels must be coupled with following modern effective educational strategies and correct scientific thinking that leads to increased interaction between learners and the skills to be learned, as learners in various sports have an educational goal to master the technical performance of those skills and when the teacher chooses a specific strategy to develop learners' performance, it must be appropriate to the characteristics and capabilities of learners and thus the goal of the learner today is how to control, store and memorize information, and how to search for it and access it is more important than all of this to help learners learn those skills, and this is done by relying on many strategies, including (the strategies adopted in the Shamk scale, which are the strategies of organization, classification, analysis, application, retention and recall of information, evaluation and criticism of information, study, preparation for the exam and its performance of the learned skills) which are One of the most important things that the learner must learn is represented by these strategies in the mechanism through which the learner learns and how he employs his mental processes in learning, remembering, thinking and solving problems (Abdul Hussein, 2015, p. 123)

Based on the researcher's background as a former football player and his observation of some problems in learning basic football skills for some players, he developed the idea of solving these problems. After presenting this idea to the supervisors, the researcher concluded by using the cognitive processing strategy included in the Shamk model to improve skills among players. Teaching using Shamk model strategies also adds a degree of excitement and freedom to students and reduces boredom and routine (Iqbal Abdul Hussein, page 97).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Methodology

The researcher used the experimental method by designing two equivalent groups with a pre-test and post-test, due to its suitability to the nature of the problem.

Research community and sample

The research community was determined intentionally, represented by first-year students in the College of Physical Education and Sports Sciences at Wasit University, numbering (124) students, represented by four departments (A, B, E, D), in order to suit the sample to the research problem. Department (A) was excluded because it represents only female students, numbering (20) students, and postponed and failed students were excluded from the remaining departments, numbering (4) students. The research sample was selected from among the departments randomly by drawing lots, and two departments were selected from a total of four departments, which are Departments (E, D). After conducting the equivalence test, whichever is the control and the other experimental, will be chosen by drawing lots, as the number of students in the control group was (20) students and the experimental group was (20) students. The exploratory experiment sample was determined, numbering (10) students.

Devices used in the research:

Test name

Targeting test on overlapping rectangles drawn on the wall.

Test objective

Measuring the accuracy of targeting.

Tools

A smooth wall on which three overlapping rectangles are drawn, with the following dimensions:

- The large rectangle with a length of (140 cm and a width of 100 cm).

- The middle rectangle with a length of (100 cm and a width of 80 cm).

- Small rectangle (80 cm long and 60 cm wide).

- Draw a line on the ground (6 m) away from the wall, (5) soccer balls.

- Colored adhesive tape for each rectangle to designate the scoring area for the test.

Description of performance

(5) soccer balls are placed (6 m) away from the target, and the tester hits the ball towards the overlapping rectangles drawn on the wall in the test according to their importance and difficulty. As shown in Figure (1).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Performance conditions

The test starts with ball (1) and ends with ball number (5).

Scoring method

The number of balls that enter the targets or touch their sides is calculated as follows:

- (3) points when scoring in the small inner rectangle.
- (2) points when scoring in the middle rectangle.
- (1) points when scoring in the large rectangle.
- (Zero) outside the scoring limits.
- The tester is given five attempts.

The maximum score for the test is (15) points.

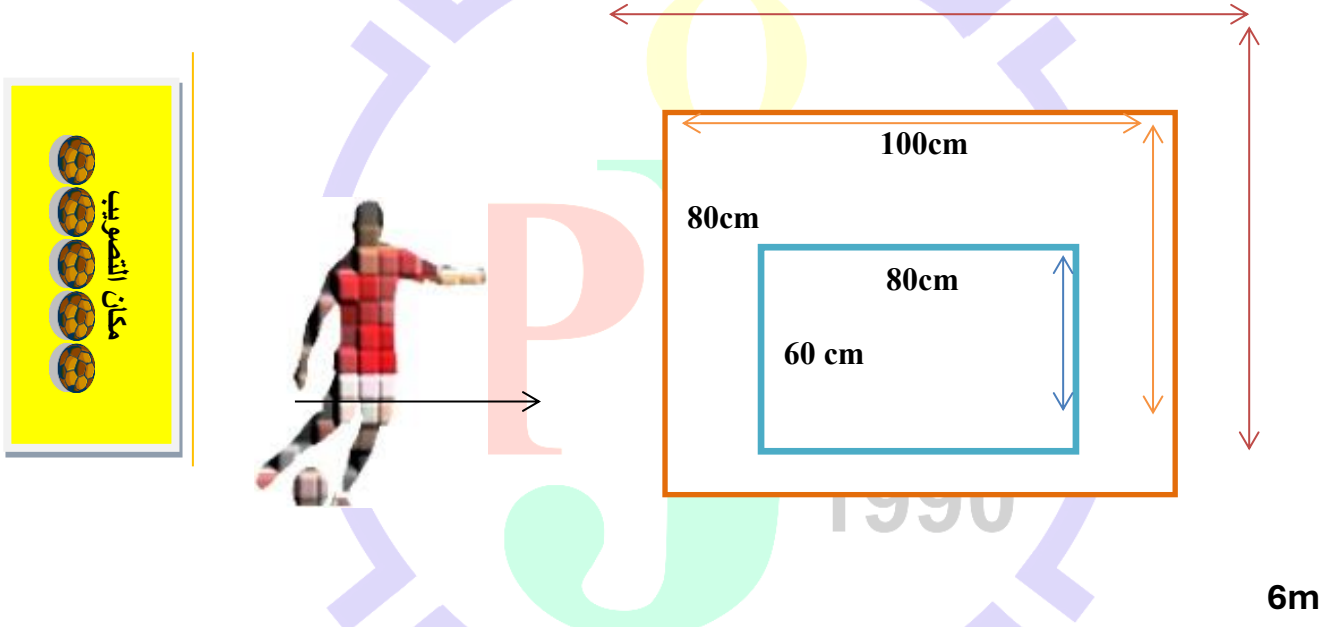

Figure (1) : Illustrating the scoring test on the target divided into degrees from a distance of (6) m

Ball Stopping Test (Zuhair Khashab et al., 1999, page 209)

Test objective: Measure the accuracy of the football extinguishing skill.

Tools used: (5) legal footballs, measuring tape, colored adhesive tape.

Performance description

The coach stands with the ball on the line opposite the tester, which is (6 m) away from the specified test area (2 x 2 m). Upon hearing the starting whistle, the coach throws the ball (high ball) towards the tester standing behind the test area to move towards the ball to

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

stop it inside the extinguishing area with any part of his body except (arms) and then return to behind the extinguishing area.

Performance conditions

The ball is thrown by moving the arms from the bottom to the top. If the coach makes a mistake in throwing it, the attempt is repeated and is not counted.

Scoring points

Two points are counted for each correct attempt.

Each tester is given (5) consecutive attempts.

The attempt is not considered valid in the following cases:

If the tester is unable to stop the ball.

If he crosses any of the extinguishing zone lines by more than a foot.

If he stops the ball in an illegal manner.

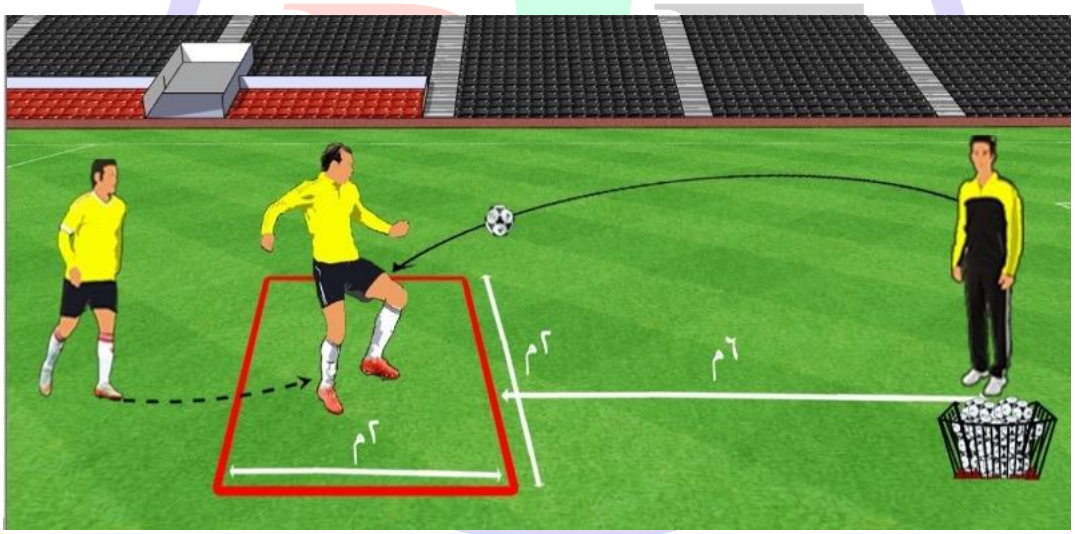

Figure (2) shows the ball stopping test inside a square (2x2m) for a distance of 6m

The researcher conducted the exploratory experiment on the experimental group on Sunday, 11/12/2023, and in the same way on the control group on Thursday, 11/9/2023, to test the ball control and scoring skills on a sample of (10) students from outside the research sample from the first-stage students. The experiment began at exactly ten o'clock in the morning, and after (7) days, the experiment was repeated on the individuals themselves to reveal the validity of the devices, tools, research tests, and the assistant work team. After that, the researcher extracted the scientific foundations for the tests.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The researcher applied the cognitive processing scale test to the research sample for the experimental group on Sunday 11/19/2023 and conducted the pre-test for the control group on Thursday 11/16/2023. Then the researcher conducted the pre-tests for the skills of scoring and ball control for the experimental group on Sunday 11/26/2023. In the same way, the test was conducted on the control group on Thursday 11/23/2023. Then the researcher gave two introductory lectures on the required skill. The test of the skills studied in the research, which are the skills of suppression and scoring, was applied to the research sample, which numbered (20) students for the control group and (20) students for the experimental group after adjusting all variables and preparing all the test requirements and tools with the help of the assistant work team and under the supervision of the researcher.

After completing the application of the educational curriculum on the members of the experimental group, which included (12) educational units, the researcher conducted the post-tests on Sunday, 2/11/2024, for the experimental group and on Thursday and 2/8/2024 for the control group. The post-tests of the scale were conducted on Sunday and Thursday, corresponding to 2/15-18/2024, under study, on all members of the basic experimental sample, the two groups (experimental and control), and with the same conditions and specifications of the pre-measurement to obtain data and record it in special forms in preparation for statistical processing.

Table 1: shows the details of the educational curriculum

No.	curriculum	details
1	Number of weeks	12
2	Number of units per week	1
3	Total number of educational units	12
4	The duration of the educational unit	90 Minute
5	"The total duration of the educational units per week	90 Minute
6	"The total duration of the educational units per month	360 Minute
7	Curriculum time	4320 Minute
8	Average number of exercises in educational units	4 Exercises
9	Number of exercises in the curriculum	48 Exercises
10	Number of educational units for each skill	4 Educational units

Statistical Analysis

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The research data were processed automatically using the Statistical Package for the Social Sciences (SPSS) to calculate the values of percentages, arithmetic mean, standard deviation, the t-test.

Results

Table (2): shows the significance of the differences between the pre-post measurement in cognitive processing and some basic football skills for the (control) group.

Statistical processors / Variables	Previous test		Subsequent test		The value of the calculated for(t)	Statistical evidence
	M	SD	M	SD		
Cognitive treatment	7.22	0.92	7.61	1.87	0.65	unsignificant
Suppression	6.96	1.13	6.30	1.06	0.88	unsignificant
Scoring	4,53	1,12	9,20	1,20	10,04	Significant

Significant at a significance level of > or equal to (0.05)

Table (3): shows us the arithmetic means, standard deviations, calculated (t) value, and significance level between the results of the pre- and post-tests

Statistical processors / VariableS	Previous test		Subsequent test		The value of the calculated for(t)	SIg	Statistical evidence
	M	SD	M	SD			
Cognitive treatment	27.25	1.788	34.15	1.647	5.821	0.00	Significant
Suppression	3.45	1.79	4.101	1.45	4.254	0.003	Significant

Significant at a significance level of > or equal to (0.05)

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Discussion

By displaying and analyzing the results of the post-tests in cognitive processing and some basic skills in football for the control and experimental research groups in Table (2 and 3), it was found that there were significant differences in favor of the experimental group. The researcher attributes these significant differences to the effectiveness of the strategies of the Shamk model in cognitive processing, which were applied by the experimental group, as the educational units that were prepared according to this strategy increased the students' self-confidence and worked to get some of them out of isolation and fear of participation, in addition to transforming their negative attitudes into positive ideas and attitudes that led to motivating them to participate, love the curriculum, desire to participate, and drive towards the correct performance of education. In this regard, Wajih Mahjoub (1985) states that "admiration for movement and motivations play a major role in the process of learning and mastering skills" (Wajih Mahjoub 1985, p. 87). The strategies of the Shamk model in cognitive processing also work to provide information to students in a rich and diverse educational environment that encourages them to bear responsibility themselves and push them to achieve the desired educational goals. This is what Muslim Muhammad Jassim points out. Abdul Wahid Mahmoud Muhammad (2016) said that "teaching using the strategies of the Shamk model in cognitive processing works to improve the cognitive abilities of the student and gives them a sense of acceptance with others, self-confidence and preparation for self-education. Teaching using the strategies of the Shamk model also provides an opportunity for students to present the concepts of the subject matter in a way that differs from the traditional style of teaching, which depends entirely on the teacher. Teaching using the strategies of the Shamk model also adds a degree of excitement and freedom to students and reduces boredom and routine" (Iqbal Abdul Hussein, p. 97). The environment provided by the strategies of the Shamk model depends on providing assistance to the student at a time when he may stumble, which leads to an increase in the knowledge and skills that enable him to pass the educational situation and interact with it positively in a way that achieves the desired educational goals. It also leads to developing the student's ability to acquire and retrieve information, and then developing their ability to understand and absorb information and facts, in addition to developing their ability to employ this information and apply it in new educational situations, as the use of the strategies of the Shamk model provides students with support and assistance by directing them to the path of interaction with the educational situation. To reduce the confusion and frustration he may feel and thus overcome the situation and achieve his own learning. (Razzaq Awad, 2024, page 19)

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The role of feedback given to students has also contributed effectively to the development of learning and continuously whenever the type of error is identified, so that students are divided and work in groups to facilitate the difficult task so that feedback can be given more correctly and effectively "since giving feedback in a way that knows the results in the event of improvement in achievement through learning the motor skill." (Ryuta. Kawashima 2000, p. 698) The strategies of the Schmuck model are characterized as a learning style based on social interaction with characteristics such as achieving deep thinking, familiarity of partnership and support to avoid failure and frustration and increase learning motivation, learners' enthusiasm, and clarity of directions to clarify the purpose of science, and ensure its continuity and the completion of its tasks accurately by presenting their predictions, as it works to link them to reliable and modern sources of knowledge. (Molenaar, 6 4, 2011, p623.)

Using the strategies of the Schmack model worked to provide an educational atmosphere characterized by excitement and positive interaction and increased motivation among students to achieve the best, as teaching using the strategies of the Schmack model in creative thinking and cognitive achievement leads to more continuous and effective communication between students and the teacher on the one hand and between students and their peers on the other hand, which is positively reflected in creative thinking, cognitive achievement and skill performance. The teacher can, through communication and interaction, stand on the needs of students in their various forms and transfer their cognitive and emotional experiences to them, as the strategies of the Schmack model contribute to encouraging learners to participate positively, making them feel love, confidence, partnership in learning and responsibility for it, which achieves its effectiveness, and a sense of its importance to himself, his teacher and his colleagues, and the importance of his role in achieving his success and their success in learning, through completing the tasks of this learning with mastery and reaching a feeling and value of what He learns it, and enjoys it through his awareness, functional aspects, and benefit (Youssef Qatami, page 74). Reem Al-Hazmi (2015) also confirms that “the strategies of the Shamk model work to arouse the learner’s motivation, and focus on his positive and active role, so that it leads to achieving goals and developing many skills” (Reem Al-Hazmi 2015, page 24).

Conclusions

The educational curriculum according to the Shamk model had a clear and effective impact on processing information for football students. The impact of the educational curriculum according to the Shamk model in developing the most important basic skills studied (ball control, scoring).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

The necessity of relying on the Shamk model in building educational curricula for students of the Faculty of Physical Education and Sports Sciences. The necessity of intervention and combination of theoretical and skill aspects in building educational curricula for students of the Faculty of Physical Education and Sports Sciences.

The necessity of applying the educational curriculum to other samples and skills.
The necessity of paying attention to students' levels and gradual education from easy to difficult.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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The Effect of Using the Pentagram Strategy as a Modern Tool for Teaching the Chest Pass and Layup Skills in Basketball for Juniors Under 14 Years Old

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Abstract

The purpose of this study was to investigate the effect of Pentagram strategy as a contemporary approach in teaching chest pass and layup skills of basketball among under 14 years junior students. The researcher employed experimental method with equivalent groups (experimental and control) with pre-test and post-test. The sample of the study was composed of 16 players from the specialized school of Youth and Sports Ministry that was divided into two groups. The experimental group received a program of 24 instruction units, three per week, using the Pentagram strategy where the skills are divided into five dimensions and developed progressively. The findings indicated that significant differences at chest pass and layup skills were found in favor of the experimental group, and Pentagram intervention program gives also a positive contribute to juniors's skill performance. The researcher suggested that this plan should be adopted in the educational programs of basic motor skills since it positively affects active thinking, cooperation work and the students' self-motivation.

Keyword: Pentagram Strategy, Chest Pass, Layup Skill, Youth Basketball Training.

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Journal of Physical Education
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Introduction

Basketball is one of the most popular sports, characterized by excitement, competitiveness, and collective performance, as it is both a team-based and spectator-oriented game. The complex nature of basketball, with its high physical, technical, tactical, and mental demands, as well as the rapid collective and individual movements required, necessitates the development of multiple skills and physical abilities to achieve a high level of performance, especially during match situations and their associated pressures. Scoring more points than the opposing team, which largely depends on shooting skills, is one of the decisive factors in winning games. This requires continuous development at both the player and team levels, achieved through improving physical, technical, and tactical attributes. Experts and specialists in the field continuously work on developing these aspects through research and studies aimed at advancing the game. Basketball includes many fundamental skills that begin with beginners learning dribbling in its various forms as the foundational stage, followed by passing and then shooting, which together contribute to the integration of motor and cognitive processes.

A lot of attention and research has been on novice players as they signify the backbone of future players. Motor learning in this age is a key factor to aid beginners in comprehending and acquire the skills they must learn. Several learning methods, strategies have been proposed; the Pentagram method is one of the recent ones. This approach seeks to yield a new model of learning for students, and initiate the teaching of advanced level thinking skill like planning, monitoring, evaluating etc. It depends on posing so-called 'specific learning tasks' that give learners the motivation to go out explore and find information on their own. Its efficacy is based on organizing material through a good framework using judiciously chosen sources. The approach leads learners incrementally through one stage to another with end points being defined learning outcomes.

Pentagram strategy can motivate learners to solve problems with the real situation and prepare the various tools/equipment, organize individuals/groups to stimulate thinking autonomously/interacting together in cooperative learning in kind experience. It uses critical thinking and enables students to gain new knowledge and relate it to the world around them. It mirrors actual experience, limits misinterpretation and increases efficient learning by connecting information to the learner emotionally, psychologically, and intellectually. Therefore, learning should not be just supplying knowledge or information; rather it should help learners gain a profound understanding and high-order thinking.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

This study aims to analyze the effect of the Pentagram strategy on developing basic basketball skills among beginners. The strategy is based on dividing training into five main components, which may include ball control, shooting, passing, movement without the ball, and defense, with the goal of providing comprehensive training that improves both individual and team performance. Basketball, as a team sport, requires mastering a set of fundamental skills such as passing, dribbling, and shooting, which form the basis for developing players' technical and performance abilities, particularly in the early stages of learning.

Accordingly, it has become necessary to adopt modern teaching strategies that enhance learning efficiency and motivate learners. Among these strategies, the Pentagram strategy stands out as it relies on teamwork within small groups, which contributes to developing cooperation, shared thinking, and improved motor performance. Several studies have indicated that employing this strategy in sports may have an effective impact on learning motor skills in a more interactive and in-depth manner (Al-Zubaidi, 2020).

The main objective of this research is to identify the effect of the Pentagram strategy on improving basic basketball skills among beginners. The Pentagram is an innovative training method based on dividing exercises into five aspects or dimensions aimed at improving athletic performance. The research seeks to measure the effectiveness of this strategy in developing fundamental skills such as dribbling, passing, and shooting.

It is necessary to establish the methods and strategies for sports learning that will increase learner's performance, in particularly at younger ages requiring a solid foundation of skill-learned in different sports, especially basketball. Specialists have therefore attempted to provide with schools, colleges and universities a variety of educational apparatus and teaching methods which they hope will save time, work and money in learning. A significant development was detected in certain basic skills, chest passing, bounce passing and lay-up shooting especially through the researcher watching of the competitions accompanying Iraqi premier basketball league for juniors and youth. This deficiency, in combination with learners not being able to improve their skills moving from one level to the next and compete against professional foreign players has hampered transferring certain tactical plans demanded by coaches and beating defensive opponents. That has had a negative impact on the general level of Iraqi basketball and the performances of the teams." So, employing the Pentagram system should aid in developing these foundational skills.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Research Questions

- What is the effect of the Pentagram strategy on learning basic basketball skills (chest pass and layup) among beginners?

Objectives of the Study

1. To identify the Pentagram strategy in teaching some basic basketball skills to beginners.
2. To determine the effect of exercises using the Pentagram strategy on learning some basic basketball skills among beginners.

Research Hypotheses

1. There are no statistically significant differences between the pre- and post-tests of the experimental group in developing passing and layup skills among beginner basketball players.
2. There are no statistically significant differences between the pre- and post-tests of the experimental group in developing passing and layup skills among basketball players.
3. There are no statistically significant differences in the post-tests between the experimental groups in developing passing and layup skills among beginner basketball players.
4. There are no statistically significant differences between the pre- and post-tests in learning some basic basketball skills.

Justification and Importance of the Research

1. Skill performance learning: presenting an integrated educational model that contributes to accelerating the acquisition of basic skills.
2. Enhancing teamwork: exercises focusing on tactical aspects help improve coordination among players.
3. Developing training methods: benefiting from diverse models of physical and tactical skill exercises.

Basic basketball skills for beginners, particularly passing and layup shooting, are essential for developing an effective offensive team performance. Players must master these skills with accuracy and speed, as they are key to linking skills together and enabling players to assess game situations and make appropriate decisions during matches. This study seeks to improve these skills through appropriate training exercises.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Research Scope

- Human field: Players of the Specialized Basketball School under 14 years old.
- Time field: From 8/2/2025 to 14/4/2025.
- Spatial field: Specialized Basketball School.

Methodology

The nature of the study variables determines the research method used; therefore, the experimental method was considered the most appropriate for addressing the research problem. The experimental approach is regarded as the most suitable method for identifying cause–effect relationships and represents one of the most valid approaches for solving several scientific problems in a practical manner (Allawi & Kamel, 1999, p. 217). Accordingly, the researcher adopted the experimental method using the equivalent groups design with pre- and post-tests, as it suits the nature of the research problem. The results were compared before and after implementing the educational program on the study sample.

Population and Sample

The available research population means the part of the total population which he is able to observe and from which he can draw his sample directly (i.e., without intermediate samplings). The sample needs to be drawn from a small and well-defined group of people that were chosen for reasons other than for the study that is being conducted and should have similar characteristics as well as possess attributes of the research population (Al-Tamimi, 2015, p. 222).

The study sample was used for this study which included players of billiard of Al-Said Sports Club under 14 years of age. The sample was composed of 16 players, who were divided into (8) control and (8) experimental groups within the total population of this age group in the 13 clubs. The research elected the sample according to its adequacy to offer the information required for the objectives of this study. The experimental group received training based on the Pentagram method.

Table 1. Descriptive Statistical Data and Sample Homogeneity

Variable	Statistic	Chest Pass	Layup
Mean	Arithmetic Mean	9.1875	0.09140
Median	Median	9.0000	0.08700
Std. Deviation	Standard Deviation	1.32759	0.011730
Skewness	Skewness	0.9780	0.5190
Std. Error of Skewness	Standard Error of Skewness	0.5640	0.5640

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Minimum	Minimum Score	8.00	0.06890
Maximum	Maximum Score	12.00	0.11680

Table 2. Differences in Means, Standard Deviations, and t-Value for Pre-Tests Between the Two Groups for Equivalence

Test	Unit	Groups	Mean	Std. Deviation	Mean Difference	Std. Error	Calculated t-value	Sig. Value	Result
Chest Pass	Score	Experimental Group	9.1250	1.24642	-0.125	0.686280	0.1820	0.8580	Not Significant
		Control Group	9.2500	1.48805					
Layup	Score	Experimental Group	0.0936130	0.01193740	0.0044250	0.00595430	0.7430	0.4700	Not Significant
		Control Group	0.0891880	0.01187990					

Significance is considered when $p < 0.05$ at a degree of freedom (14).

Table 3. Agreement of Experts and Specialists on the Tests

No.	Test	Total Experts	Disagreeing Experts	Agreeing Experts	Percentage	Significance
1	Chest Pass	11	0	11	100%	Significant
2	Layup	11	1	10	90.91%	Significant

Agreement is considered significant when it reaches 75% or higher.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 4. Validity and Reliability of the Tests and the Self-Validity Coefficient (Square Root of Reliability)

No.	Test	Test–Retest Reliability	Sig. Value	Self-Validity	Objectivity	Significance
1	Chest Pass	0.983**	0.000	0.99	1.00	Significant
2	Layup	0.663**	0.005	0.81	0.989**	Significant

Objectivity is similar to reliability in terms of the consistency or similarity of results, but it also considers differences among evaluators to ensure obtaining the same outcomes (Ameer, 1997). Objectivity refers to the absence of variation among assessors in judging a particular issue or subject (Bahi, 2012). It also means that test results are not influenced by the personal factors of the evaluator, such as mood or subjective judgment (Khalifa & Al-Adawi, 2002, p. 193).

The researcher determined the objectivity of the physical and motor tests by recording the scores assigned by two judges and analyzing the results statistically using Pearson's simple correlation coefficient between the scores of the first and second judges. When comparing the calculated values, it was found that all tests were significant at a significance level of (0.05), indicating that the physical and motor tests selected for the study were objective. The cognitive test also demonstrated high objectivity as it is less susceptible to bias.

Data Collection, Tools, and Devices Used

1. Arabic and foreign sources and references.
2. Personal interviews with experts and specialists.
3. Information from the international internet network.
4. Observation and analysis.
5. Laptop computer (HP).
6. One electronic stopwatch (Flott).
7. Basketball sports halls.
8. Basketballs (10).
9. Measuring tape (50 meters).
10. One iPad device (Apple).
11. Whistle.
12. Cones.
13. Marker indicators.
14. Poles.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Skill Tests

First: Chest Pass Test (Baranov & Alexey, 2005)
Name of the test: Chest Pass Test
Purpose: To measure the player's ability to perform the chest pass accurately toward a fixed target.
Equipment:

- Basketball.
- Flat wall.
- Adhesive tape to mark the distance (usually 2.4–3 meters from the wall).
- Stopwatch.

Procedures

1. The player stands at a specified distance from the wall (approximately 2.4–3 meters).
2. The player performs chest passes toward the wall with maximum possible speed and accuracy.
3. The player attempts to hit a mark on the wall at chest level.
4. The player performs as many passes as possible within a specified time (30 seconds to one minute).

Evaluation

- The number of successful passes hitting the target within the specified time is counted.
- Performance is recorded based on accuracy and speed. (The illustration shows the chest pass test in basketball, where the player passes the ball toward a specific target on the wall.)

Second: Lay-up Shooting Test (source not accurately specified)
Purpose: To evaluate the player's accuracy and speed in performing lay-up shots while in motion.
Equipment: Basketball, stopwatch, basketball hoop.

Procedures

1. The player stands at or slightly behind the free-throw line.
2. The player starts running toward the basket while dribbling.
3. Upon approaching the basket, the player performs a lay-up shot using the backboard.
4. The attempt is repeated from both the right and left sides.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Evaluation

- The number of successful lay-up shots is calculated from a set number of attempts (e.g., 10 attempts).
- Speed and accuracy of performance are also assessed.

Pilot Study

The pilot study is a smaller version of the main experiment, which is easier to carry out by keeping its properties as similar to those in the primary experiment as we can and we try to take

advantage on it (Wajih Mahjoub & Ahmed Badr, 2002, p. # 35). The researcher, aided by the assistant's group with him, performed the pilot on Saturday 1/2/2025 at 3 p.m., i.e., at the Ministry of Youth and Sports courts and halls, for players who were not part of the main study sample. The pilot sample was made of four players under 14. The aims of the pilot study include:

- Determining the time required to conduct the tests.
- Assessing the readiness and performance of the assisting team.
- Identifying potential difficulties during implementation and addressing them.
- Ensuring the suitability of the equipment used in the tests.
- Identifying possible errors that may occur.

Pre-tests

The researcher conducted the pre-tests on the research sample by applying the skill tests to determine and record the results of each test using data recording forms. These tests were conducted on Saturday, 8/2/2025, at 3:00 p.m., at the courts and halls of the Ministry of Youth and Sports.

Main Experiment

Applying the educational strategy Pentagram to help develop offensive skills for research sample (young players under 14 years old of Specialized Basketball School). 24 instructional units The training program was comprised 24 learning units which were delivered at the pace of three units a week for about 8 weeks.

The staff chose the training sessions that covered offensive skills considered for the research. Following the warm-up performed by technical staff, the researcher gave the exercises to be applied with a sample of eight athletes under change master coach direction for main part of training session. The exercises were the main element of the training session, which lasted 30–35 minutes. Training took place every Friday at 9 a.m., Monday at 3 p.m., and Wednesday at 3:00 p.m.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Application of the Pentagram Educational Strategy in Basketball

So, the Pentagram strategy method was applied with Al-Said Club players under 14 years in order to learn the below basketball skills (chest pass, bounce pass and low dribbling, high dribbling, lay-up shooting) by means of dividing each skill into five basic one; and every part of those training exercises were practiced separately per day during a week.

Post-tests

The purpose of conducting the post-tests was to identify and measure the differences resulting from the training program by applying the same pre-tests to the research sample while maintaining conditions similar to those of the pre-tests as much as possible. The post-tests were conducted on Monday, 14/4/2025, at 3:00 p.m., at the courts and halls of the Ministry of Youth and Sports.

Statistical Methods

The researcher used the Statistical Package for the Social Sciences (SPSS) along with several statistical procedures to obtain the results, including:

1. Arithmetic mean.
2. Standard deviation.
3. Pearson's simple correlation coefficient.
4. One-sample t-test.
5. Percentage.

Results

Table 1. Means and Standard Deviations of the Pre- and Post-Tests (Chest Pass) for the Experimental Group

Statistical Parameters	Unit	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
Chest Pass	Score	9.125	1.24	14.62	1.40

Table 2. Differences in Means, Standard Deviations, and t-Value for the Pre- and Post-Tests (Chest Pass) for the Experimental Group

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Variable	Unit	Mean Difference	SD of Differences	Std. Error	Calculated t-value	Sig. Value	Significance
Chest Pass	Score	5.50	1.309	0.462	11.881	0.000	Significant

Significance is considered at $p < 0.05$ with a degree of freedom (7).

Table 3. Means and Standard Deviations of the Pre- and Post-Tests (Layup) for the Experimental Group

Statistical Parameters	Unit	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
Layup	Score/Second	0.093	0.011	0.129	0.0114

Table 4. Differences in Means, Standard Deviations, and t-Value for the Pre- and Post-Tests (Layup) for the Experimental Group

Variable	Unit	Mean Difference	SD of Differences	Std. Error	Calculated t-value	Sig. Value	Significance
Layup	Score/Second	0.0358	0.014	0.005	7.083	0.000	Significant

Significance is considered at $p < 0.05$ with a degree of freedom (7).

Table 5. Means and Standard Deviations of the Pre- and Post-Tests (Chest Pass) for the Control Group

Statistical Parameters	Unit	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
Chest Pass	Score	9.25	1.48	11.87	1.885

Table 6. Differences in Means, Standard Deviations, and t-Value for the Pre- and Post-Tests (Chest Pass) for the Control Group

Variable	Unit	Mean Difference	SD of Differences	Std. Error	Calculated t-value	Sig. Value	Significance
Chest Pass	Score	2.62	1.84	0.65	4.02	0.005	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Significance is considered at $p < 0.05$ with a degree of freedom (7).

Table 7. Means and Standard Deviations of the Pre- and Post-Tests (Layup) for the Control Group

Statistical Parameters	Unit	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
Layup	Score/Second	0.089	0.011	0.106	0.0155

Table 8. Differences in Means, Standard Deviations, and t-Value for the Pre- and Post-Tests (Layup) for the Control Group

Variable	Unit	Mean Difference	SD of Differences	Std. Error	Calculated t-value	Sig. Value	Significance
Layup	Score/Second	0.01710	0.0223	0.007	2.167	0.06	Not Significant

Significance is considered at $p < 0.05$ with a degree of freedom (7).

Table 9. Differences in Means, Standard Deviations, and t-Value Between the Post-Tests of the Two Groups in the Chest Pass Variable

Variable	Unit	Groups	Mean	SD	Mean Difference	Std. Error	Calculated t-value	Sig. Value	Result
Chest Pass	Score	Experimental Group	14.6250	1.40789	2.75	0.831	3.306	0.006	Significant
		Control Group	11.8750	1.88509					

Significance is considered at $p < 0.05$ with a degree of freedom (14).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Table 10. Differences in Means, Standard Deviations, and t-Value Between the Post-Tests of the Two Groups in the Layup Variable

Variable	Unit	Groups	Mean	SD	Mean Difference	Std. Error	Calculated t-value	Sig. Value	Result
Layup	Score/Second	Experimental Group	0.1294870	0.01141760	0.023	0.0068	3.397	0.004	Significant
		Control Group	0.1062880	0.01558230					

Significance is considered at $p < 0.05$ with a degree of freedom (14).

Discussion

The following section shows analysis of results on the study where it discusses impact of training program on basketball skill variables. Pre- and post-tests were used to collect data from the experimental group and control group under studied skills; chest pass, and layup. We first examine the conditional factor structure separately in each group, and then we compare the two groups at post-test interpreting statistical significance.

The results of the statistical analysis demonstrated that there was statistically significant difference between the pre-and post-test levels of the experimental group in chest in-and pass skill, since calculated t value reached (11.881) at a significance level (< 0.05), and mean increased from (9.12 to 14.62). This gain is greater than that for the control group (with a t-value of 4.020 and mean post test score of 11.87), so that the increase in efficacy to the chest pass by it, was significantly below average.

The enhancement is largely associated with the structure of the training programme which utilised to a great extent, the Pentagram approach as a constructivist model involving stages such as activation, construction, representation, extension and evaluation. These stages ensured progressive cognitive–motor development of the skill from activating prior knowledge to representing the skill through applied situations, extending across various contexts and finally assessing individually and collaboratively.

This result is in agreement with Alduais (2022), who found that the use of Pentagram model was effective for enhancing students' skill understanding in sport activities, and it's considered to be significant when comparing between children learning with strategy and being taught by using a conventional method. The author suspects that the increase proportion experienced by the experimental group for chest pass test were higher than those of control group, which suggests to say that education programme based on Penatagramal strategy contributed significant enhancement in sports skills development. The educational modules comprised evidence based interventions in line with the strategy for promoting skill acquisition and maintenance of performance (Al-Rubaie & Amin, 2010).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Moreover, as we learn from the OPTIMAL theory of motor learning (Wulf and Lewthwaite, 2016), providing a motivating condition to practice such as feedback, engagement in the task or focus on the effect triggers significant gain in performance. This was indeed evident in the current study where experiential learning units with diverse chest pass drills were incorporated. Magill and Anderson (2021) also indicated that learning the basics of team sports such as passing into this section requires controlled practice sessions consisting of organized repetition and corrective feedback to adjust motor patterns and performance.

From the applicability point of view (the effect size), indeed, as becoming clear above, the huge variance between pre-test and post-test averages for experimental group with great statistically significant demonstrate that the treatment was not only sound statistically but also applied in real sense. Hamid (2021) also adduced that structuring the educative process in stages increases understanding and improves the rate at which learners are able to transfer skills into game-situations from practice sessions, a trend corroborated by the present results of enhanced accuracy and efficiency for chest pass. The literature (Al-Hayek & Hussein, 2021) reveals that the chest pass is one of the most commonly used passes in basketball since it is perceived to be fast and compatible with the offensive ready position. The exercises in the instructional program were scientifically designed and had much to improve the chest pass among experimental class against control class.

Results showed that there were significant differences in the pre- and post-test of lay-up for both groups, experimental group (t=-7.083, md=0.035) and control group (t=-2.167, md=0.017). The layup technique is regarded as one of the most difficult to master for young players, as it involves tightly controlled coordination between footwork, jumping, arm movement, visual focus, and essential decision-making during a fraction of a second at high rates of speed. This course gradually and interactively covered these elements at its levels.

The greater improvement in the experimental group relative to control group post intervention, also demonstrates that the educational package introduced based upon the Pentagram FT strategy has helped develop layup performance significantly. The drills were systematically organized scientifically and consistent with the strategy in the competition, which has resulted in significant improvement of lay-up skill performance among experimental group. An evident improvement in scoring accuracy was found after the training among the pre-test results, and there were significantly differences (< 0.05) between two groups during post-test.

This is likely due to the programming's emphasis on shooting skills (hand placement, release angle, shot repetition), and prioritization of biomechanically sound movement patterns. At the "construction" phase, a visual motor model of the skill was presented as well as breaking it into segments that allowed learners to connect these phases with the final jump. Learning from viewing correct models and through proscribed repetition, Salman & Al-Kazim (2015) argued, enables learners to generate accurate mental representations of movement – which supports future mastery.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

During the "representation" phase, participants practiced the task at increasing difficulty without a defender and with yielding [counter balance]). This step corresponds to Adnan (2007) who remarks that simple competitive activities increase motivation and lower motor anxiety especially in skills with visual-motor coordination. The development that was done by the experimental group was not only very fast, but also stable and accurate, mostly due to the direct feedback methods (individual and collective) applied, as previously indicated by Magill & Anderson (2021), who concluded that shooting requires correction strategies based on error detection and outcome-based learning.

Furthermore, cooperative learning factors supported the quality of performance involving small groups who alternated between player, observer and judge roles that helped in promoting motor perception. Al-Muhaisen (2020) pointed out that learner engagement and critical thinking about one's own work improve when learners are involved in assessment and feedback. This enhancement was not only statistically significant but also may have represented a practically important effect, given that change in performance implies an increase on playing level which is likely to be noticed under actual game conditions (e.g., for fast breaks or close-range scores).

Shooting is the final stage of offensive process in basketball and all team skills are designed to develop scoring opportunities (Hamid, 2004). Aside from that, an enhanced layup shooting certainly contributes to a team´s success and scoring in crucial game situations. Given that the contrasts are statistically significant (≤ 0.05), it is unlikely that these effects were obtained by chance. It also provides structuring skill exercises, changing training drills, and the number of attempts with the supportive training equipment to make it interesting and motivating and reduce boredom in practicing for younger players (Adnan, 2007; Salman & Al-Kazim, 2015).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Conclusions

1. The Pentagram program was found to be very successful in enhancing the quality of all five test items (chest pass, bounce pass, high dribbling, low dribbling and layup) tested between the experimental group vs. control group.
2. All of the trained skills with Pentagram reached significant differences between pre- and post-tests in favor of the post-test measures.

Recommendations

1. Applying the Pentagram strategy as a general method of instruction physical skills especially in team sports, since it has an obvious effect on developing skill performance in young children.
2. Development of curricula and practical training programs through constructivist and Interactive teaching rather than traditional repeating model.
3. Generalizing the intervention to other age categories and performance levels (e.g., students of secondary school or females) as well as to other sports (e.g., handball, volleyball), which allows greater generalization and verification of its effectiveness in various populations.

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https://jcope.uobaghdad.edu.iq

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The reality of practicing artificial intelligence for employees of Omani sports federations in accordance with Oman Vision 2040

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Abstract

AI have initiated an entirely MASSIVE shift in the sporting scene – from its multiple corners right to the administrative side of it! Methodology for current study the present investigation aimed to identify the dissemination level of artificial intelligence in employees' performance at Omani sports federations base on Oman vision 2020. These were divided into two forms: weak and strong artificial intelligence. Descriptive survey design was used to fit the purpose of this study. The sample of study was represented by (185) subjects conducted from (11) sports federations, besides the pilot sample which included (31) subjects in addition to the main subjects' collection. A purposive sample of (71) administrative personnel constituted the primary study. Supplementary data suggest that there were very significant differences in (p 0.001) between employees working in sports federations in terms of year's job experience variable. The study ended with a number of recommendations, such as forming community partnerships that include business leaders, companies and government entities involved in artificial intelligence to improve workers' skills for intelligent applications. It also proposed that employees should undertake courses at universities in training programmed designed to develop knowledge and skill in this field.

Keywords: Administrative work; Artificial Intelligence; Weak Artificial Intelligence; Strong Artificial Intelligence.

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Introduction

AI as a game changer the notion of AI, considered a prominent catalyst for several compelling operational transformations across any organizational model, is now no more an abstract idea. It is also referred to as the philosophy of machines in the thinking, behavior and performance like or close to human beings and has permeated business enterprises as an unavoidable prerequisite (Dhamija & Bag, 2020). AI is present in a variety of manifestations for different purposes such as applications, tools and intelligence levels have been categorized into several categories: weak, strong and super AI (Ahmed, 2019). Services, Decision Support System, Workflow Automation, and Enhancing Productivity are among the advantages of implementation AI based systems in government and private organizations (Rajab, 2024). This is in line with the results of Shaikh et al. (2023) "An Analysis of the influence of artificial intelligence on employees' productivity: The mediation effect of knowledge sharing and well-being," demonstrating that AI enables hospital management by examining employee productivity, analyzing its characteristics (e.g., attitudes and behavior), as highlight the main strategies regarding knowledge sharing, mental health and wellbeing in the context between AI and employee performance.

In the sports arena, AI overcame human intelligence when a machine beat one of world' best player in Go (a Chinese ancient board game where stones of 2 colors are played on a wooden board) in 2016 (Ganascia, 2018). On the management aspect in sports organizations, Atasoy et al. takes less space physically and can speedy act AI use reduce the workload for sports administrators and staff easily saves their energy, however promote learning opportunity. Moreover, Eldeep and Mohamed (2022) in their research "The role of artificial intelligence to enhance sports organizations' cognitive capabilities" revealed that AI has better inputs for decision making within the sports organization and supports data analysis as a trustworthy reference characteristic for the users. The computerized information systems are generally recognized as the smartest processing system to accomplish tasks and achieve human goals. This was supported by (Jaafar, 2020) who found that the AI applications were significantly useful in data and business analysis, predicting errors adopting alternatives, saving time and effort to accomplish job tasks, screening employment applications prior their submission to ascertain that they meet general roles requirements. Additionally, Halawa (2023) indicated that as far the senior management suppurative of AI implementation explanation on whether there is clear time schedule to run all AI related activities and if budget with its required technical infrastructures are available at the top reap a leadership mind about the significance of AI in managing human resource within sports organizations.

Among the most prominent AI applications used in the administrative aspects of sports institutions are neural networks and expert systems. The latter have played a major role in facilitating administrative processes, ensuring information accuracy, and simplifying the design and training of employees, in addition to their ability to determine appropriate methods and approaches for staff training to acquire organizational knowledge (Al-Khudari & Al-Shafie, 2023). Gu et al. (2019) in their research titled "An Expert System for Game Prediction Utilizing Big Data and Machine Learning," suggested that expert systems are important to learning techniques, the merging of data sets, evaluation of specific model results as well as dealing with challenges related to predicting the average scores of hockey games.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The second type is neural networks, which are also essential AI applications adopted in various systems within sports institutions. Zhang et al. (2019) stated in their study that the proposed model, titled "Safety Early Warning of Risks in Sports Events Based on Machine Learning of a Hidden Propagation Neural Network," demonstrates good validity and reliability and can achieve better early warning effects by verifying and comparing its outputs with theoretical data.

The Sultanate of Oman has paid significant attention to AI in the sports sector to keep pace with global developments by developing the Oman Sports Strategy 2040, derived from Oman Vision 2040, which includes digital transformation among its goals and strategic directions through the creation of electronic platforms and smart applications supported by AI (Ministry of Culture, Sports and Youth, 2021).

Administration barriers in Oman's sport sector that has an impact on the quality of development and performance. Therefore, it is imperative to implement smart applications as solutions that enhance work efficiency, accomplish big-data processing and render other facilitative services. Such a requirement suggests the need for more specialized research on AI in sports, consistent with Dindorf et al. (2022). Further, the Royal Orders that formulated from the eighth session of Oman Council for adoption of National Artificial Intelligence Programmed have offered huge boost and encouragement in this scenario (Al-Abri, 2023). Thus, examining and investigating AI application practices among members of staff within sports federations in the Sultanate of Oman becomes a crucial point according to Oman Vision 2040; seeing that these federations are considered as the official sports body which is responsible for the development and promotion of sport at national and international levels to maintain sporting excellence.

Research Questions

What is the current reality of practicing AI applications in the performance of employees in sports federations in light of Oman Vision 2040?

Are there statistically significant differences at the level of ($P < 0.001$) according to the variable of years of experience in the sports federation regarding the practice of AI applications in employee performance in light of Oman Vision 2040?

Study Limits

Spatial: Sports federations in the Sultanate of Oman.

Temporal: 2023/2024.

Human: Employees working in sports federations in the Sultanate of Oman.

Methodology

Study Methodology

The descriptive survey method was adopted as it is appropriate for the purposes of the study.

Study Population

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The study sample included workers in sports federations in Oman (11) federations. The final number of participants was (185), including (160) men (86.4%) and (25) female (13.5%) (Ministry of Culture, Sports and Youth, 2022).

Study Sample

The sample was selected conveniently among the administrative staff employees.) employed at sports federations in Oman except the ones holding technical or manual posts in the federations (drivers, guards and messengers). Paper survey formats of the questionnaire were given to them. To be impartial in the context of science, regarding minimum sample size the thematical equation suggested by Serdar et al. was used. (2021) for questionnaire-oriented studies, having in mind the total population size (185), which is a small number. Therefore, minimum sample size was calculated as not maximum than (67) people depending on certain conditions such as the level of confidence (1.28), limit error (0.05) and dispersion rate 0.20. The following is according to this, where the data were gathered from (71) subjects. Of these, (63) patients were Omani and represented 88.7% of the study population, (8) patients were non-Omani representing (11.2%) and represents the main sample for this study file.

$$N = \frac{\frac{p(1-p) \times Z2}{e2}}{1 + \frac{p(1-p) \times Z2}{ne2}}$$

Table 1. *Research Sample According to the Independent Variables of the Study (N = 71)*

Variable	Variable Levels	Number	Percentage	Total
Sports Federations	Cycling	2	2.8%	71
	Volleyball	5	7.0%	
	Basketball	3	4.2%	
	Handball	2	2.8%	
	Tennis	3	4.2%	
	Hockey	3	4.2%	
	Aquatic Sports	3	4.2%	
	Athletics	4	5.6%	
	Camel Racing	14	19.7%	
	Equestrian	9	12.7%	

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

	Football	23	32.4%	
Gender	Male	55	77.5%	71
	Female	16	22.5%	
	General Diploma or below	20	28.2%	
Educational Qualification	Higher Diploma & Bachelor's	39	54.9%	71
	Master's & PhD	12	16.9%	
Years of Experience in the Federation	0–10 years	33	46.5%	71
	11 years and above	38	53.5%	
	Excellent	14	19.7%	
Level of Computer Use	Very Good	28	39.4%	71
	Good	28	39.4%	
	Weak	1	1.4%	

Study Instruments

Relevant to the aim of this study, the adequate tool was chosen. The research objectives were achieved by a close-ended survey as the main data collection instrument. Each of the questions in the questionnaire was framed on a 5-point Likert scale, after being accepted by the experts' panel of its appropriateness for this nature of study.

First: Instrument Validity (Questionnaire)

Face validity was verified through expert judgment, while internal consistency and construct validity of the questionnaire items were tested using Cronbach's alpha reliability coefficient.

Face Validity of the Questionnaire

The expert review was conducted to determine the face validity by applying it on a sample of (11) reviewers from inside and outside Sultanate of Oman specialists and experts in physical education, sport sciences, information technology. They were asked to comment on whether the scale was suitable for their study and the suitability of items in the questionnaire as well.

Internal Consistency Coefficient

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Reliability of the instrument was assessed by applying the study tool to a small pilot sample (n = 31) for determination of statistical test that could be used in evaluating internal consistency. Normal distribution of dependent variables was confirmed using the Kolmogorov–Smirnov test. Statistical The results showed that the all data were not normally distributed (P > 0.001). Consequently, Spearman's correlation coefficient was used as an inferential statistical test to investigate internal consistency.

Table 2. *Spearman Correlation Coefficient and Significance Values of the Items with the Dimension (n = 31)*

No.	Correlation Coefficient (Spearman)	Significance Value (p)
1	0.294	0.109
2	0.680**	0.00
3	0.539**	0.002
4	0.717**	0.00
5	0.589**	0.00
6	0.540**	0.002
7	0.200	0.281
8	0.772**	0.00
9	0.783**	0.00
10	0.597**	0.00

As disclosed in the above table, statistical significances were found out between items of questionnaire and score of dimensions by our own research results (α >0.05), which showed that this questionaire had a fair degree of criterion-related validity. The finding also indicated that the Spearman correlation coefficients of items (2, 4, 5, 8,9 and 10) were highly statistically significant p 0.05). In comparison, the results did not show that items (1 and 7) were statistically significant.

Second: Reliability of the Study Instrument

To verify the reliability of the instrument, Cronbach's alpha coefficient was used to determine the internal stability of the scale.

Table 3. *Cronbach's Alpha Reliability Coefficients for the Study Instrument (n = 31)*

Dimension	Number of Items	Cronbach's Alpha
Employees' Practice of Artificial Intelligence in Sports Federations	10	0.85

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The previous table shows that the Cronbach's alpha reliability coefficient for the questionnaire items was (0.85), which is considered an acceptable and appropriate value. Accordingly, the questionnaire is suitable for application to the study sample. Reliability is considered acceptable at a level of (0.70) and above, as indicated by Pallant (2020).

Test–retest reliability was also used to examine the stability of the questionnaire, with a one-week interval between the two applications on a pilot sample of (31) individuals from outside the main study sample. The correlation coefficient between the two administrations was calculated using the Intraclass Correlation Coefficient (ICC). Additionally, the Measure of Agreement (Kappa) was used to determine the level of agreement and consistency between the two applications. Table (4) presents the correlation values between the first and second administrations.

Table 4. *Reliability Coefficient (ICC) and Kappa Coefficient for the First and Second Administrations (n = 31)*

Dimension	ICC Reliability Coefficient	95% Confidence Level	Statistical Significance	Kappa
Employees' Practice of Artificial Intelligence in Sports Federations	0.84	0.66 – 0.92	0.00	0.31

The previous table indicates that the ICC value between the test and retest of the questionnaire instrument reached (0.84), and all items showed high statistical significance ($p < 0.001$). The Kappa index reached a moderate level (0.31). These indicators are considered appropriate and demonstrate that the study instrument possesses adequate reliability and is capable of achieving the objectives of the present study.

Study Procedures

A set of procedures was implemented in the current study as follows:

1. The questionnaire was prepared and presented to experts from inside and outside the Sultanate of Oman, followed by reviewing and modifying the dimensions and items according to their feedback.
2. The questionnaire was finalized and its main format was reviewed.
3. Training workshops and discussion sessions were conducted for the targeted group in sports federations through field visits and the researcher's direct presence.
4. A pilot sample (n = 31) was collected from ten (10) sports federations.
5. Necessary statistical analyses were conducted to measure the validity and reliability of the questionnaire after testing its normal distribution.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

6. The questionnaire was prepared in its final form and administered directly to the study sample, with data collected from (11) sports federations, resulting in an actual study sample of (n = 71).
7. The data of the current study were analyzed and appropriate statistical treatments were selected after testing their distribution in accordance with the study objectives.

Results

Table 5. *Analytical Table for Research Question (1): The Current Reality of Practicing Artificial Intelligence Applications in the Performance of Employees in Omani Sports Federations in Light of Oman Vision 2040*

Item No.	Statement	Strongly Agree	Agree	To Some Extent	Disagree	Strongly Disagree	Chi-square (χ^2)	Statistical Significance	Overall Direction	Rank
1	AI is used in attendance and absence recording.*	7 (9.9%)	51 (71.8%)	6 (8.5%)	5 (7.0%)	2 (2.8%)	120.19**	p < 0.00	Highly significant	Agree
2	AI is used in customer service for registration, booking, and responding to inquiries.*	1 (1.4%)	16 (22.5%)	11 (15.5%)	33 (46.5%)	10 (14.1%)	39.35**	p < 0.00	Highly significant	Disagree
3	AI assists employees in decision-making.**	11 (15.5%)	0 (0%)	6 (8.5%)	46 (64.8%)	8 (11.3%)	60.66**	p < 0.00	Highly significant	Disagree
4	AI is used in analyzing annual data such as activities, competitions, and events and providing final indicators.**	6 (8.5%)	15 (21.1%)	6 (8.5%)	41 (57.7%)	3 (4.2%)	68.93**	p < 0.00	Highly significant	Disagree
5	AI is used in writing periodic and annual reports.**	4 (5.6%)	9 (12.7%)	8 (11.3%)	46 (64.8%)	4 (5.6%)	90.47**	p < 0.00	Highly significant	Disagree

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

6	AI is used in solving problems related to job tasks.**	1 (1.4%)	3 (4.2%)	5 (7.0%)	54 (76.1%)	8 (11.3%)	141.32**	p < 0.00	Highly significant	Disagree
7	AI is used in internal and external correspondence.*	4 (5.6%)	57 (80.3%)	3 (4.2%)	6 (8.5%)	1 (1.4%)	162.16**	p < 0.00	Highly significant	Agree
8	AI is used in sorting files and data according to programmed conditions.*	5 (7.0%)	37 (52.1%)	4 (5.6%)	24 (33.8%)	1 (1.4%)	68.93**	p < 0.00	Highly significant	Agree
9	AI is used to generate new alternatives for accomplishing job tasks.**	1 (1.4%)	13 (18.3%)	6 (8.5%)	48 (67.6%)	3 (4.2%)	106.39**	p < 0.00	Highly significant	Disagree
10	AI is used in dealing with stored data on players, administrators, technicians, referees, and others.*	5 (7.0%)	42 (59.2%)	9 (12.7%)	15 (21.1%)	0 (0%)	47.02**	p < 0.00	Highly significant	Agree

Note: (p < 0.001) represents the degree of freedom value for the total Chi-square test for all items included in Table (5), *Weak AI / **Strong AI

Table 6. *Analytical Table for Research Question (2): The Effect of Years of Experience on the Practice of Artificial Intelligence Applications in the Performance of Employees in Omani Sports Federations in Light of Oman Vision 2040*

Item	Statement	Years of Experience	Strongly Agree	Agree	To Some Extent	Disagree	Strongly Disagree	Chi-square	Statistical Significance	Effect Size (Cramer's V)
1	AI is used in attendance and absence recording.*	0–10 years	2 (6.1%)	23 (69.7%)	2 (6.1%)	5 (15.2%)	1 (3.0%)	7.12	0.129	—
		11 years and above	5 (13.2%)	28 (73.7%)	4 (10.5%)	0	1 (2.6%)			

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2	AI is used in customer service for registration, booking, and responding to inquiries.*	0–10 years	1 (3.0%)	8 (24.2%)	4 (12.1%)	13 (39.4%)	7 (21.2%)	4.57	0.334	—
		11 years and above	0	8 (21.1%)	7 (18.4%)	20 (52.6%)	3 (7.9%)			
3	AI assists employees in decision-making.**	0–10 years	0	7 (21.2%)	1 (3.0%)	20 (60.6%)	5 (15.2%)	4.43	0.218	—
		11 years and above	0	4 (10.5%)	5 (13.2%)	26 (68.4%)	3 (7.9%)			
4	AI is used in analyzing annual data such as activities, competitions, and events and providing final indicators.**	0–10 years	4 (12.1%)	8 (24.2%)	2 (6.1%)	18 (54.5%)	1 (3.0%)	2.00	0.736	—
		11 years and above	2 (5.3%)	7 (18.4%)	4 (10.5%)	23 (60.5%)	2 (5.3%)			
5	AI is used in writing periodic and annual reports.**	0–10 years	2 (6.1%)	6 (15.2%)	5 (18.2%)	18 (54.5%)	2 (6.1%)	3.33	0.503	—
		11 years and above	2 (5.3%)	3 (7.9%)	3 (7.9%)	28 (73.7%)	2 (5.3%)			
6	AI is used in solving problems related to job tasks.**	0–10 years	1 (3.0%)	1 (3.0%)	2 (6.1%)	25 (75.8%)	4 (12.1%)	1.48	0.829	—
		11 years and above	0	2 (5.3%)	3 (7.9%)	29 (76.3%)	4 (10.5%)			
7	AI is used in internal and external correspondence.*	0–10 years	1 (3.0%)	25 (75.8%)	3 (9.1%)	3 (9.1%)	1 (3.0%)	5.53	0.237	—
		11 years and above	3 (7.9%)	32 (84.2%)	0	3 (7.9%)	0			
8	AI is used in sorting files and data according to programmed conditions.*	0–10 years	3 (9.1%)	18 (54.5%)	4 (12.1%)	7 (21.2%)	1 (3.0%)	9.08	0.059*	0.358
		11 years and above	2 (5.3%)	19 (50.0%)	0	17 (44.7%)	0			
9	AI is used to generate new alternatives for	0–10 years	0	8 (24.2%)	5 (15.2%)	19 (57.2%)	1 (3.0%)	6.45	0.168	—

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

	accomplishing job tasks.**	11 years and above	1 (2.6%)	5 (13.2%)	1 (2.6%)	29 (76.3%)	2 (5.3%)			
10	AI is used in dealing with stored data on players, administrators, technicians, referees, and others.*	0–10 years	3 (9.1%)	19 (57.6%)	3 (9.1%)	8 (24.2%)	0	1.30	0.729	—
		11 years and above	2 (5.3%)	23 (60.5%)	6 (15.8%)	7 (18.4%)	0			

Note: ($p > 0.001$) represents the degree of freedom value for the analytical Chi-square test for all listed items, except item (8), which showed statistical significance.

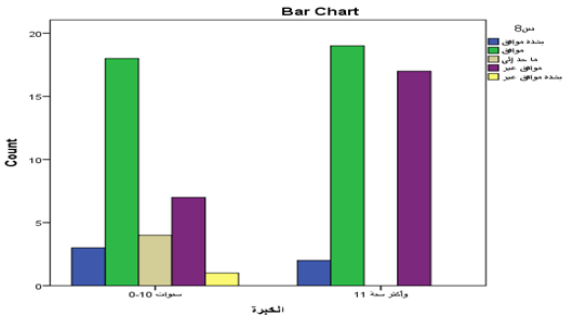

Figure 1. *Differences in the Variable of Years of Experience for Item (8): Use of Artificial Intelligence in Sorting Files and Data According to Programmed Conditions.*

Discussion

The results presented in Table (5) indicate that all items of the dimension were highly statistically significant at the level of ($p < 0.001$). The total Chi-square values ranged between (39.35–162.16). The indicators showed that the items related to weak artificial intelligence were generally directed toward the "agree" level. Their percentages ranged between (52.1%–80.3%) for items (1, 7, 8, and 10), except for item (2), which showed an overall "disagree" direction at a percentage of (46.5%). These items reflected the use of AI in attendance and absence systems, file sorting, and dealing with stored data, among others.

Conversely, statements that described strong artificial intelligence had an overall tendency toward "disagree" level (percentages between 57.7%–76.1%) of agreement for items (3, 4, 5, 6 and item 9) in which use was related to: intelligent applications within data analysis toolkits; job-related problem solving; writing reports of periodic and annual nature; and support in the decision-making process. This suggests that the application of AI technology among Omani sports federations' staffs is low. This finding is in line with the study carried out by Abu Al-Saud (2023) on the use of AI in Ministry of Youth and Sport, Olympic Committee, clubs and sports Federations in Egypt which determines that there is less use of AI within these institutions that needs to be developed. This also coincides with Ding (2019) who stressed the necessity of AI tools integration in the Chinese

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

sports industry to minimize and correct mistakes, achieve accurate indicators, arguing that there is an urgent call for this kind of development in those Arab and Asian countries as these technologies recently appeared and developed rapidly.

Item (7) ranked first among the items categorized under weak AI, with a Chi-square value of (162.16), and an agreement rate of (80.3%). This item addressed the use of AI in internal and external correspondence to facilitate workflow for employees. This suggests the presence of actual practices among staff and the role of AI in strengthening communication between employees, sports federations, and relevant institutions, thereby facilitating job tasks for both parties. The result conforms with Jaafar (2020) work that AI aid administrative processes involved in human resource management of sport institutions as well as the study by Shelley (2023) showing how AI applications can administratively support and accelerate HR functions notwithstanding adoption challenges.

Item (6) ranked last among the strong AI items, addressing the use of AI in solving problems related to the work environment. It recorded a total Chi-square value of (141.32) and a "disagree" percentage of (76.1%). This suggests that employees' practices require more advanced AI-supported intelligent systems capable of providing accurate indicators, alternatives, and solutions that facilitate administrative processes. This is consistent with the assertion of Naraine and Wanless (2020) that there should be increased attention to smart applications that would deepen interaction between sports management and sports consumers, solve problems as well as facilitate automation in business operations, sales and others needed to achieve institutional excellence.

Ranked highest of the items that were strong AI, item (4) focused on sports federations (for those not governing tribes and nations) using AI applications to analyse data for tasks, activities and events. Chi-square value is (68.93), 8.5% strongly agree, and 21.1% agree for it. This reflects an early indication of a high level of AI use by employees in some sports federations in Oman. This fact was corroborated by the field observations realized during the visit of the researcher and it is even easier to be confirmed in the places where they are, mainly through monitoring on financial and administrative analysis data, with use of precise indicators and representing incipient efforts towards the rationalization in managing digital sports. This finding is in line with Nasri and Khashaimiya (2021) who indicated that the use of AI applications, like neural networks for sports management purposes are able to analyze and audit data by identifying errors, fraud and irregularities.

Item (2) unique from other weak AI items, conveyed a general "disagree" trend at (46.5%). It also covered the way in which customers could interact with smart systems to submit a query, register (or sign up) and make a booking. As a result, this speaks to the low uptake of more sophisticated AI-powered d systems for digital inquiry and booking services by sports federations that benefit those within the sports community.

In conclusion, the reported reality of practicing AI applications for the Omani sports federations' employees in the light on Oman Vision 2040 still need further efforts to build a workforce with some mastery of it. The implementation of AI applications in job tasks is at the weak AI level and that calls for more development to transform efforts towards the strong AI level in agreement with Oman Vision 2040, having digital transformation as a cornerstone of change across governmental organizations. This also falls within the line of work of the executive plan for the Omani sports strategy toward developing smart applications and digital platforms to keep pace with technical progress in serving sports.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The variable of years of experience was selected due to its importance in supporting the current study by identifying the general orientation of employees toward smart applications across different age groups and experience levels. It also aims to determine whether differences exist in employees' attitudes toward these applications based on thinking patterns and levels of interaction with technology, which may influence administrative processes and work quality within sports federations. This question was addressed using analytical Chi-square tests, percentages, and Cramer's V effect size to measure responses related to years of experience, which were divided into two levels: (0–10 years) and (11 years and above).

As can be seen from table (6), at a level of ($p > 0.001$) the statin results for employees working in sports federations in terms of years of professional experience for all its items did not find any significant statistical differences except that found on item (8) where it was strikingly significant (0,059) with Cramer's V effect size = (358), which represents high effect (>0.25), analytical Chi-square value -(9.08). Natter Shaun would explain that "AI" Apps were used in pre motherboards to auto sort optimized files or data-according to programed conditions. The results suggest that lower-experience workers (0–10 years) were more likely to use weak AI applications, which allow them to most quickly and effectively organize files and work through their jobs the most accurately. The percentage of agreement for this group was (61.5%) compared to workers with an experience of 11 years and above, who scored (50.0%).

This may imply that younger employees have more smart applications contacts because technological and digital transformations of Omani societies they are working for as well they are exposed more than older employees to new developments. This conclusion is in agreement with those of Galeshi et al. (2018), who investigated behavioral diversity across millennial sub-dimensions seeking health-related information in the United States and found that young people are more experienced with technology, more involved in digital communication, and dependent on technology compared to older employees. The orientations of the younger employees conform with Oman Vision 2040 and its leading towards digital transformation.

Conclusions

1. The level of practice among employees in Omani sports federations is classified at the level of weak artificial intelligence.
2. There are emerging indications of strong artificial intelligence in some sports federations, attributed to developmental practices and individual initiatives undertaken by these federations.
3. Years of professional experience do not significantly influence the practice of artificial intelligence applications in employee performance within Omani sports federations, except in the use of AI for sorting files and data according to programmed conditions.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

1. Developing specialized training programs in artificial intelligence applications to enhance the level of practice among employees in sports federations by the Ministry of Culture, Sports and Youth and the administrations of sports federations, in alignment with Oman Vision 2040.
2. Establishing a specialized technical support unit in artificial intelligence, staffed with qualified human resources, by the Olympic Committee to support AI implementation among employees in sports federations.
3. Encouraging individual and collective initiatives, as well as innovative youth talents in this field, to contribute to improving employees' levels of competence in artificial intelligence.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The impact of game simulation drills on blocking and various defensive movements for handball players (15–18 years old)

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Abstract:

The importance of studying the effect of playing simulation exercises in the chest wall and the various defensive moves of handball players (15-18 years old), in an effort to find out the effectiveness of this type of exercise in the development of comprehensive defensive performance, and achieving integration between the skill side and the plans of the juniors, to build a scientific training base that contributes to the preparation of players capable of defensive performance with high efficiency in the later stages, the research problem was summarized by the following question: Does the use of playing simulation exercises contribute to the development of the level of defensive performance, especially in the chest wall and defensive moves the variety of defensive abilities of handball players of the category (15-18 years old) compared to traditional training methods ،The objectives of the research were to prepare play simulation exercises to develop the chest wall and various defensive moves for handball players (15-18) years, and to identify the results of play simulation exercises in the development of the chest wall and various defensive moves for handball players (15-18) years. The researchers used the experimental method with two experimental and control groups to fit the research problem, the research community consisted of the players of the Maysan handball education team for the academic year 2023-2024, numbering 16 players, the players were divided in a random way into two experimental and control groups with (6) players for each group, players were excluded for the exploratory experiment and other players being goalkeepers, homogenization was carried out between the two groups for variables (height, weight, chronological age, training age), appropriate devices and tools were used, as well as appropriate tests and measurements for the studied variables the statistical bag (SPSS) was used.26) to process the results were analyzed And to discuss the results according to modern scientific sources to reach conclusions from them (there is a clear superiority of the dimensional

tests of the experimental and control groups over the tribal tests in the research variables, and there is a superiority of the dimensional tests of the experimental group at the expense of the dimensional tests of the experimental group in the research variables) as for the recommendations, including (the inclusion of simulation exercises of playing

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

regularly within the curricula of handball training in general, especially the age groups, and the design of exercises so that they are with real positions of play and include changing directions quickly, correct positioning, interaction with the ball and colleagues).
Keywords: game simulation drills, blocking, defensive movements, handball

1. Research Identification

1.1 Introduction and Significance of the Study

Handball is considered one of the fast-paced team sports characterized by a wide variety of competitive situations and an overlap between offensive and defensive roles. This requires players to possess a high level of physical, technical, and tactical abilities, particularly in defensive aspects, which represent one of the most important factors in achieving superiority in matches. The "structure of defence" is considered the backbone of shutting opponents' attacks down and not allowing scoring chances, and this in turn benefits team results at various age levels.

The defensive shielding and the diverse defensive movements play a key role in the handball defense system. Good blocking leads to a decreased shot angle and opponent disturbance, whereas varied defensive movements help to cover gaps, support team matesand quickly switch from defense to offense. To accomplish this sort of performance demands that the players exhibit a high level of teamwork with each other by requiring large-scale coordination and the skill to make snap decisions under shifting game situations.

Innovations in training theory have also seen a relatively new type of game simulation exercise develop, known as game-based training with an objective of making match-related training situations more realistic than the traditional approaches. This is done by simulating real competitive conditions with respect to the speed of play, pressure and diversity of movement options. These exercises help to combine physical, technical and tactical skills in a single frame and enable players to train motor and tactical responses accordingly to those which the game requires.

All who play sport need this type of training, and is even more important for youngsters 15-18 as this represents a key period in the development of long term technical and tactical foundations when players move from general to specific performance. Nevertheless, field observations show that many training programs for youth players include isolated exercises, which may not be sufficiently representative of the complex defensive actions performed during matches.

It has been demonstrated in several studies that such exercises [i.e. those imitating match play] are very efficient in addressing players' technical and tactical skill, as they enhance the physical and psychological component of the game connected with hard situations and to bridge the theory part of teaching with its practical implication (Salim, 2019, p. 122). Horton (2021, p. 85) further stressed that the practice of drills simulating real game-playing scenarios contributes to developing speed of motor response as well as

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

fast decision making and building coordination among team members when handling alterations in defensive situations.

The current research is important as it investigates the impact of game-based simulation exercises on defensive block and diversified movements in defense among 15- to 18-year-old handball players; in order to determine effectiveness of this sort of training for developing general defensive performance and integration between technical and tactical aspects with youth athletes. This ultimately contributes to building a scientific training base that helps prepare players capable of high-level defensive performance in later stages.

1.2 Research Problem

Defensive movements in handball are among the most important technical aspects contributing to achieving tactical superiority during matches, as organized defensive performance represents a key factor in thwarting attacks and reducing pressure on the goalkeeper. Although coaches often place considerable emphasis on offensive aspects during training sessions, the defensive aspect—particularly defensive blocking and diversified defensive movements—often does not receive sufficient focus and development. This leads to a decline in the effectiveness of the team's collective defense.

Based on field experience and observation of youth handball training programs in several clubs, most training units lack the use of exercises that simulate real playing situations. Defensive exercises are often performed in a traditional manner, detached from the realistic situations encountered by players during matches. This traditional training approach makes it difficult for players to make appropriate decisions and to time positioning or jumping accurately when forming defensive blocks or transitioning between individual and collective defense according to the flow of play. Accordingly, the research problem is formulated in the following question:

Does the use of game-based simulation exercises contribute to improving the level of defensive performance—particularly defensive blocking and diversified defensive movements—among handball players aged 15–18 years compared with traditional training methods?

Answering this question represents a scientific attempt to address one of the shortcomings in defensive training for youth handball players and to present a more realistic training approach that contributes to improving defensive abilities and enhancing tactical performance effectiveness during matches.

1.3 Research Objectives

1. To design game-based simulation exercises aimed at developing defensive blocking and diversified defensive movements among handball players aged 15–18 years.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2. To identify the effect of game-based simulation exercises on the development of defensive blocking and diversified defensive movements among handball players aged 15–18 years.

1.4 Research Hypotheses

1. There are statistically significant differences between the pre-test and post-test results of both the control and experimental groups in favor of the post-tests.
2. There are statistically significant differences in the post-test results between the experimental and control groups in favor of the experimental group.

1.5 Research Scope

1.5.1 Human Scope: Players of the Maysan Directorate of Education handball team.
1.5.2 Temporal Scope: From 11/1/2024 to 16/3/2024.
1.5.3 Spatial Scope: Martyr Saad Khalaf Sweif Hall.

2. Research Methodology and Field Procedures

2.1 Research Methodology

The methodology is defined as "the path followed by the researcher to achieve the research objectives based on a set of rules and principles, the most important of which is understanding the nature of the problem under study, which imposes the selection of an appropriate methodology to reveal the truth in question" (Allawi & Rateb, 1999, p. 232). Accordingly, the experimental method with two equivalent groups (experimental and control) was employed, as it is suitable for addressing the research problem.

2.2 Research Population and Sample

The research population was intentionally selected and consisted of players of the Maysan Directorate of Education handball team for the academic year 2023–2024, totaling 16 players. The research sample was selected by lottery, comprising 12 players. These players were divided into

two groups: an experimental group and a control group, with 6 players in each group. Two players were excluded for the pilot study, and two others were excluded because they were goalkeepers. Table (1) presents the details of the sample. Homogeneity between the two groups was established for the variables of height, weight, chronological age, and training age, as shown in Table (2).

Table (1): Research Population and Sample

Sample Category	Number	Percentage

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Main sample	12	75%
Pilot study sample	2	12.5%
Excluded players (goalkeepers)	2	12.5%
Total	**16**	**100%**

Table (2): Homogeneity of the Research Sample

Variables	Unit of Measurement	Mean	Median	Standard Deviation	Skewness Coefficient
Height	cm	174.1	174	2.64	0.31
Weight	kg	67.6	68	4.83	0.25
Chronological age	years	17.1	17	0.87	0.22
Training age	years	3.8	4	0.63	0.13

2.3 Means, Devices, and Tools Used

- Interview, observation, questionnaire, and testing
- Result recording forms
- Laptop computer (DELL)
- Laser printer (Canon 2900)
- Stopwatch (1), SONY
- Whistle
- Measuring tape
- Adhesive marking tape (5 cm width)
- Handball court
- Handballs (5)
- Two uprights with a height of 2.60 m
- A rope 50 cm in length with a handball attached

2.4 Field Research Procedures

2.4.1 Tests Used

First: Two-Direction Defensive Blocking Test (Jirjis, 2004, p. 158)

- **Purpose of the test:**
  To measure the defensive blocking skill.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- **Equipment used:**
  Two uprights fixed to the ground with a height of 2.60 m. From each upright, a rope 50 cm in length is suspended with a ball attached. The height of the ball from the ground is 2.10 m, positioned in the 9 m area.
- **Performance method:**
  The participant stands on the 6 m line and moves forward with a slight incline toward the 9 m line, such that the distance between the player and the suspended ball is 3 m. The distance between the two balls is also 3 m. The player's movement path forms an equilateral triangle, with each side measuring 3 m. The participant jumps vertically to touch the ball with both hands, then moves backward to the 6 m line. This performance is repeated continuously for 30 seconds, as illustrated in Figure (1).
- **Scoring:**
  One point is awarded for each correct attempt in which the ball is touched with both hands.

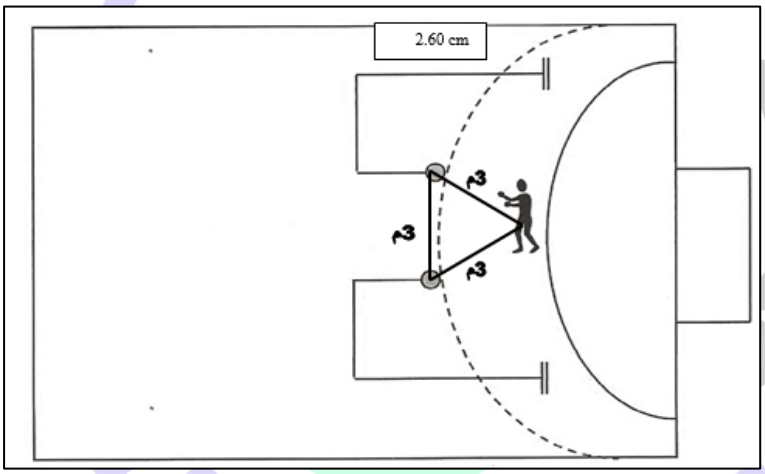

Figure (1): Defensive Blocking Test

Second: Defensive Movements Test (Mutab, 2004, p. 139)

- **Purpose of the test:**
  To measure the defensive movement skill.
- **Equipment:**
  A flat surface and adhesive tape only, used to mark the shape as illustrated in Figure (2) on the playing court.
- **Performance specifications:**
  Movement is performed along a triangular shape with a total side length of 4.5 m,

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

such that each side measures 1.5 m. Each side represents the distance between two points. At the beginning, the player moves from A to B with a defensive facing action. Next, the player runs from (B) to (C), running backwards on a small incline. Then the player travels from (C) to point (A) and we are introduced to the lateral movement.

The same performance is then repeated by moving from point (A) to point (B) to point (D), and then back to point (A). The player continues repeating this sequence for the required duration of 30 seconds.

- **Scoring:**
  One point is awarded for each point (A, B, C, D) reached by the player within the 30-second test duration.

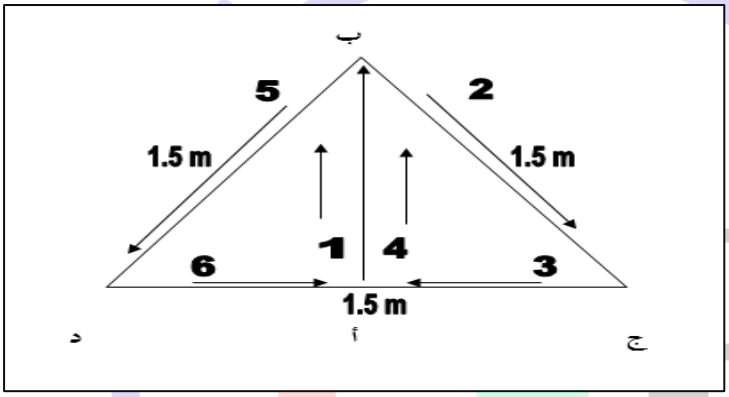

Figure (2): Defensive Movements Test

2.4.2 Pilot Study

In order to identify the positive and negative aspects that may arise in the future, avoid them, and develop, omit, or modify certain procedures (Tuʿaymah, Niʿmah, & Al-Mu'min, 2024, p. 726), the researchers conducted a pilot study on Thursday, 11/1/2024. The pilot study was carried out on a sample of secondary-school handball players from the Maysan Directorate of Education team, consisting of players drawn from the research population but excluded from the main sample. The objectives of the pilot study were to:

1. Identify the timing and equipment related to the tests.
2. Identify potential obstacles that might occur during the main experiment.
3. Ensure the adequacy of the assisting research staff before implementation.

2.4.3 Pre-Tests

The researchers, together with the assisting research staff, conducted the pre-tests for both the experimental and control groups on Wednesday, 17/1/2024, at Martyr Saad

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Khalaf Sweif Hall at 3:00 p.m. Group equivalence was established based on the results of these tests, as shown in Table (3).

Table (3): Equivalence of the Two Research Groups

Tests	Unit of Measurement	Experimental Group (Mean)	SD	Control Group (Mean)	SD	t-test	Sig.	Significance
Defensive blocking	Score	4.16	0.75	4.33	0.81	0.36	0.72	Not significant
Defensive movements	Score	14.33	1.03	14.66	0.81	0.62	0.70	Not significant

Not significant at a significance level of (0.05) and with (10) degrees of freedom.

2.4.4 Main Experiment

The main experiment was implemented on the players of the experimental group after completing the pre-tests and confirming the homogeneity of the two groups in the variables under investigation. The experiment aged for 8 weeks with three training sessions per week on Saturday, Monday and Wednesday (from Saturday 20/1/2024 to Wednesday 13/4/2024). Game-based simulations were nested within the body of the training unit to last 45–55 minutes each.

All the exercises were performed in the indoor Martyr Saad Khalaf Sweif Hall (directly supervised by researchers) and included progressive overload-principle and exercise variation. The total number of training sessions was 24 (three times a week for 8 weeks). All training units were planned by following the principle of progressive load increase and progression as gradually advancing to maximal attainable effort as possible.

The significant portion of each training unit was aimed to promote an enhanced defensive performance of the players with progressive intensity (from 70% up to 100% from personal level demanded), according to the principle of overload. During the first 2 weeks (Weeks 1–2), intensity was moderate (70–75%) to neuromuscular preparation and device performance pattern familiarization, as well as appropriate rest intervals between exercise sets. In weeks 3–5, the intensity was increased to 80–90%, with a relative reduction of training volume and an increased focus on performance quality under near-

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

maximal exertion demands. In the last phase (Weeks 6–8), one weekly session was dedicated to maximal effort (100%) for working on maximum capacity combined with longer rest, so that athletes will be able to last longer under pressure.

It was distributed based on a weekly training workload between three days of training: the one that took place on Saturday at moderate intensity (70–85%), the second one on Monday at maximal effort (100%) or high intensity (85–95%), and the last one performed in Wednesday, which was addressed at moderate to high intensity weaving together technical-tactical aspects and player application. During the intervention of main period, the volume and intensity of training load were strictly controlled and the players' physical status was monitored. Combining the golden rule of defense conduct in quality over quantity was a common interest to warrant players' safety and maximize training performances.

2.4.5 Post-Tests

The post tests were conducted on Saturday 16/3/2024, after implementation of the training program which included 24 training unit over 8 weeks at Martyr Saad Khalaf Sweif hall. Great care was taken to maintain similar testing conditions as the pre-tests in terms of location, apparatus and assisting staff so that we could ensure that results were valid and reliable.

2.5 Statistical Methods

The Statistical Package for the Social Sciences (SPSS, version 26) was applied to compute statistical indices including means, standard deviations, medians, skewness coefficient as well as the results of independent-samples t-test, one-sample ttest and non-parameter mean differences along with their standard errors (SEs), degrees of freedom (df) and significance levels.

3. Presentation, Analysis, and Discussion of the Results

3.1 Presentation of the Pre-Test and Post-Test Results of the Experimental Group

Table (4): Pre-Test and Post-Test Results of the Experimental Group

Tests	Unit of Measurement	Pre-Test (Mean)	SD	Post-Test (Mean)	SD	Mean Difference	Standard Error	t-test	Sig.	Significance
Defensive blocking	Score	4.16	0.75	8.83	1.16	4.66	0.61	7.59	0.001	Sig

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Defensive movements	Score	14.33	1.03	17.92	1.22	3.95	0.60	6.93	0.001	Sig

Significant at a significance level of (0.05) and with (5) degrees of freedom.

Based on Table (4), the results indicate that there are statistically significant differences between the pre-test and post-test of the experimental group in favor of the post-test in the defensive blocking test. The mean score of the pre-test was 4.16 points with a standard deviation of 0.75, whereas the mean score of the post-test reached 8.83 points with a standard deviation of 1.16. The mean difference between the two tests was 4.66 points, and the standard error was 0.61. Statistical analysis using the t-test revealed that the calculated t value was 7.59, which is statistically significant, as the significance level (0.001) is lower than the adopted significance level (0.05) with 5 degrees of freedom. This indicates that the differences were statistically significant in favor of the post-test for the experimental group.

Regarding the defensive movements test, the results indicate statistically significant differences between the pre-test and post-test of the experimental group in favor of the post-test. The mean score of the pre-test was 14.33 points with a standard deviation of 1.03, while the mean score of the post-test reached 17.92 points with a standard deviation of 1.22. The mean difference between the two tests was 3.95 points, and the standard error was 0.60. Statistical analysis using the t-test showed that the calculated t value was 6.93, which is statistically significant, as the significance level (0.001) is lower than the adopted level of significance (0.05) with 5 degrees of freedom. This indicates that the differences were statistically significant in favor of the post-test for the experimental group.

3.2 Presentation of the Pre-Test and Post-Test Results of the Control Group

Table (5): Pre-Test and Post-Test Results of the Control Group

Tests	Unit of Measurement	Pre-Test (Mean)	SD	Post-Test (Mean)	SD	Mean Difference	Standard Error	t-test	Sig.	Significance
Defensive blocking	Score	4.33	0.81	6.50	0.54	2.16	0.40	5.39	0.003	Significant
Defensive	Score	14.66	0.81	16.33	1.21	1.66	0.49	3.37	0.020	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

moveme nts								

Significant at a significance level of (0.05) with (5) degrees of freedom.

Based on Table (5), the results indicate statistically significant differences between the pre-test and post-test of the control group in favor of the post-test in the defensive blocking test. The mean score of the pre-test was **4.33** points with a standard deviation of **0.81**, while the post-test mean reached **6.50** points with a standard deviation of **0.54**. The mean difference between the two tests was **2.16** points, and the standard error was **0.40**. Statistical analysis using the *t*-test revealed a calculated *t* value of **5.39**, which is statistically significant, as the significance level (**0.003**) is lower than (**0.05**) with **5 degrees of freedom**. This indicates that the differences were significant in favor of the post-test for the control group.

In the defensive movements test, the results also show statistically significant differences between the pre-test and post-test of the control group in favor of the post-test. The pre-test mean was 14.66 points with a standard deviation of 0.81, whereas the post-test mean reached 16.33 points with a standard deviation of 1.21. The mean difference between the two tests was 1.66 points, and the standard error was 0.49. Statistical treatment using the t-test showed a calculated t value of 3.37, which is statistically significant, as the significance level (0.020) is lower than (0.05) with 5 degrees of freedom. This confirms that the differences were statistically significant in favor of the post-test for the control group.

3.3 Presentation of the Post-Test Results of the Experimental and Control Groups

Table (6): Post-Test Results of the Experimental and Control Groups

Tests	Unit of Measurement	Experimental Group (Mean)	SD	Control Group (Mean)	SD	t-test	Sig.	Significance
Defensive blocking	Score	8.83	1.16	6.50	0.54	4.42	0.001	Significant
Defensive movements	Score	17.92	1.22	16.33	1.21	3.31	0.008	Significant

Significant at a significance level of (0.05) with (10) degrees of freedom.

Based on Table (6), the results indicate statistically significant differences between the post-test results of the experimental and control groups in favor of the experimental group in the defensive blocking test. The average of the post-test for the experimental group was 8.83 (SD = 1.16) and the control group had an average score of 6.50 (SD=0.54). The t-test statistics calculated (t=4.42) are significant, as the significance level of 0.001 is less

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

than the accepted value of 0.05 with df of 10. This means that there were statistically significant differences between the two groups.

In the defensive movements test, there were also statistically significant differences between post-test scores of the experimental and control group in favor of the experimental group. The experimental group mean score was 17.92 points, standard deviation 1.22 and in the control group 16.33 points with a standard deviation of 1.21. Statistical analysis using t test resulted in a computed t value of 3.31, which is statistically significant, as the significance (0.008) was less than the level of significance (0.05) with 10 degree of freedom. This validates that the differences were not a matter of chance in favor of the experimental group.

3.4 Discussion of Results

Based on the results presented in Tables (3), (4), and (5), a clear superiority of the post-test results for the experimental group is evident, along with a marked improvement of the experimental group compared with the control group. This finding indicates that game-based simulation exercises were effective in developing defensive blocking performance, as they reflect the real demands of game situations and encourage players to perform with greater accuracy, speed, and responsiveness consistent with actual competitive conditions.

This advantage can be due to the game-based simulation exercises used in the experimental group of this study for these were elaborated so that they could reproduce training moments as close as possible to real match conditions. Through this, players could then confront defensive conditions corresponded for game play so as to better enable them to perceive the trajectory of the ball and take proper positioning for an effective block in their defense. Furthermore, those exercises were based on an intricate context that involved cooperation between two or more players, which coherently resulted in better collective defensive behavior. Excised neuromuscular interaction efficiency and reaction speed, as elements of successful defensive blocking.

The observed improvement can also be explained by the fact that situational, game-simulated exercises increase players' defensive awareness and enhance their level of mental concentration during performance. In addition, such exercises strengthen the relationship between kinesthetic perception and the temporal timing of defensive movement, leading to more precise and efficient performance in stopping attacks. The competitive and enjoyable nature of these exercises further increased players' motivation, which was positively reflected in their technical performance. These findings are consistent with the views of Mohamed Hassan Allawi (2014), who emphasized that the use of training situations simulating real play contributes to improving skill performance through the integration of physical and mental aspects (Allawi, 2014, p. 233).

Similarly, Abdel Hamid Sharaf (2018) indicated that situational training develops defensive abilities through repetition under conditions similar to competition (Sharaf, 2018, p. 112). Defensive blocking, in particular, is a defensive skill that requires rapid

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

decision-making and correct positioning, and it can be effectively developed through exercises that incorporate real playing situations (Al-Sibaei, 2017, p. 145). Qasim Hassan (2019, p. 98) also noted that training based on simulation contributes to enhancing nervous system efficiency and increasing neuromuscular coordination in collective defensive situations (Hussein, 2019, p. 98).

With regard to the results of the defensive movements tests, the experimental group also demonstrated superiority over the control group. This can be explained by the fact that game-based simulation exercises focused on developing diversified defensive movements through multiple defensive situations requiring rapid changes of direction, correct positioning, and continuous interaction with the ball and teammates. This approach enhanced players' ability to make quick and effective defensive decisions during matches.

In addition, the superiority and development trend can be the result of game-based simulation exercise used to enhance diversified defensive movements, which allowed players with more accurate, faster and responsive performance under competitive match situations as well as facilitate group synchronization in defense. The remarkable enhancement of performance in the experimental team is also owing to that these drills did not concern only with physical content, but also combined skills intelligence and tactics. This enabled players to adjust their defensive positioning on the fly, in response to changes in play surrounding them. Furthermore, the competition between players in those conditions and constraints improved concentration and motivation during practice. This contrasts with Mustafa (2015) who claimed that situational drills enhance defensive performance comparable to game-like situations, where athletes are reproducing match pressure scenarios.

4. Conclusions and Recommendations

4.1 Conclusions

1. The post-test results of both the experimental and control groups showed clear superiority over the pre-test results in the research variables.
2. The post-test results of the experimental group were superior to those of the control group in the research variables.
3. Game-based simulation exercises were effective in developing defensive blocking and defensive movements in the experimental group.
4. Game-based simulation exercises contribute to linking physical performance with cognitive abilities, thereby increasing players' defensive awareness and speed of decision-making.
5. Game-based simulation exercises enhance neuromuscular coordination and collective cohesion during play.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

4.2 Recommendations

1. Game-based simulation exercises should be regularly incorporated into handball training curricula in general, particularly for youth age categories.
2. Training exercises should be designed to reflect real game situations and include rapid changes of direction, correct positioning, and interaction with the ball and teammates.
3. Competition and challenge should be incorporated within training units to motivate players and increase their level of motivation.
4. Performance should be periodically monitored using standardized tests to identify strengths and weaknesses in order to adjust training programs accordingly.
5. Similar studies are recommended to be conducted on other samples.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
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(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The effect of preventive exercises using different weights on improving some health fitness variables for first-year female students at the College of Physical Education and Sports Sciences for Girls

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Abstract

The research aims to prepare preventive exercises using different weights to improve some health fitness variables to reduce injury among female students of the College of Physical Education and Sports Sciences for Girls, first stage. The researcher used the experimental method because it is suitable for the nature of the research. The researcher used the experimental design with pre- and post-measures for two groups, one experimental and the other control. The research was conducted on a sample of (65) female students of the first stage of the College of Physical Education and Sports Sciences for Girls, Section (A), Section (B), and Section (C). One of the most important results was that the experimental group outperformed the control group in health fitness variables (strength characterized by speed, motor speed, flexibility, agility, coordination, balance). This is due to the implementation of preventive exercises using the step box with weights for the targeted muscles proposed by the researcher on the experimental group. The experimental group did not achieve a significant increase in bio-kinetic abilities tests (transitional speed, reaction speed) over the control group. One of the most important recommendations was the need to be guided by the content of preventive exercises using different weights in some motor abilities because of what they achieved. Positive impact on first-year female students at the College of Physical Education and Sports Sciences for Girls.

Keywords: preventive exercises, health fitness.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Sport is naturally good for you, but participation in any exercise, as we know can lead to a number of different types of injuries. These can inflict a variety of muscle groups and joints in the body, particularly the loading-bearing joints such as knees and ankles. They are especially prevalent among novices. Preventive measures have become of the greatest significance in contemporary fundamental Principles in therapeutic physical education, which lies right now on prevention of damage and reducing it to an absolute minimum by studying sports traumas as well as methods of prevention, treatment actions at their occurrence. Health-related fitness is also a critical factor in lessening injury severity. It is seen as a basic cornerstone of an individual's existence that help to increase physical capacity and prevent injury in addition to improving the person's ability to function in sports and dip significance. Health related fitness promotes components of physical capabilities including speed, strength, agility, and flexibility amongst others and work to develop these elements significantly contributes to protecting the human body from injuries as well as diseases (Jaber, 2015; p.47).

Physical fitness represents the basic foundation for sports performance in both competitive sport and sport for health, which has given it a prominent status among specialists. Throughout history, physical fitness h Physical capacities are statistical foundations of sports performance in both high level sport and health-oriented sport, which is why they occupy a special place among experts. Physical fitness has always been, and will always be, a notion that survives despite the fact that there are dozens of new terms identifying physical and health status that can leave readers' heads spinning because of the sheer number of related concepts. Its significance is maintained due to the further development of its components and fields (Abdul Latif & Sabhan, 2023).

has a continued relevance even though various new terms have been introduced to express status of physique and health, which can be overwhelming for the readers because many have similar concept. It is due to the continuous development of its components and fields that it has been able to maintain its importance (Abdul Latif & Sabhan, 2023).

The concept of physical activity includes competitive (high-level) sport, recreational (moderate- and low-level) sport, and health-related fitness. Physical fitness and overall general health are closely related to each other (physically as well as psychosocially). It is difficult to think of a person who exercises steadily and at the same time suffers from physical or psychological health problems and in which those two variables are directly proportional (Hamoudi & Rashid, 2022).

Research has demonstrated the positive impact of preventive exercises on health-related fitness components, including:

· Muscular strength is developed by increasing the ability of the muscles to support joint and withstand loads.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

· Muscle endurance increase: the individual's ability to work (in general) over an extended period of time without becoming too fatigued – most other sports are repetitive.

· Improving balance, reducing risk of falls and movement-related injuries.

· Enhanced flexibility and mobility help your horse to move more freely and to limit muscle spasm.

· It indirectly helps to maintain a healthy cardiorespiratory system by exerting the body in moderate-intensity exercises (Al-Fay, 2024, p. 1).

The ability to perform preventive exercises with different weights compels the individual to exert more power and specificity, high-quality resistance that can be modified for a personal training level will induce strong muscular stimulation and improvements in health-related fitness components. While these exercises help in developing the body since they work on muscles and joints, using different weights on each workout will enhance the resistance to various movements making less likely for a sprain or fracture. Secondary prevention exercises also improve overall physical fitness by improving muscle strength, flexibility, endurance and balance as well as reducing risk for disease and injury due to strengthening of muscles and increased flexibility and balance (Nouri, 2015, p. 49).

Some first-year female students of the Colleges having Physical Education and Sports Sciences also encounter injuries in practical classes because of their physical stress. In addition, many of these students were unaccustomed to consistent sports practice in secondary school nor had they ever taken any extracurricular playing lessons before college; which led them to be unprepared for the rigorous practical sessions that took place over the course of a week. As a consequence, injuries and physical discomfort become evident in and outside of the class room with serious implications on their practical performance. According to the investigator's practical experience in this field, and also because of her being a student in College of Physical Education and Sports Sciences (and an acquaintance with similar previous studies) due to her familiarity with different injuries that can occur following sport activities, preventive exercises using various weights were chosen for the same purpose. Significance of the study is identifying types and distribution of sports injuries which happen by practicing activities within college of physical education and sports sciences, also to study effect caused by practice these exercises on some health variables between female students. The research also is intended to create a knowledge base for prevention and protection, utilize proper means of injury reduction, recognize deficiencies and respond as appropriate with scientifically sound techniques.

The research problem seeks to answer the following questions:

- Which are the prevalent injuries to first year female students in College of Physical Education and sports science?

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Are preventive exercises with varied loads effective in improving some health-related physical fitness levels of female students at the College of Physical Education and Sport?

Research Objectives

- To design preventive exercises using different weights to improve certain health-related fitness variables and reduce injuries among first-year female students in the College of Physical Education and Sports Sciences.
- To identify the extent of the effect of preventive exercises using different weights on improving certain health-related fitness variables among first-year female students in the College of Physical Education and Sports Sciences.
- To identify the effect of preventive exercises using different weights on improving certain health-related fitness variables.

The research of Gaith Hamed Shaker and Haider Jumaa Asri (2024), "Impact of Several Preventive Exercises for Knee Injuries on training Some Motor Abilities to Basketball Players 18-Years- Old." The purpose of the study was to investigate the influence of interventions in knee injury prevention on some selected motor skills of U18 basketball players. It is postulated that a difference will occur between the control and experimental groups in follow-up tests favoring the experimental group. The experimental method was used. The participants were 16 immature basketball players aged less than (18) years in Al-Rawdatain Club of Karbala who played for Iraqi Central Basketball Federation activities for season (2023–2024). They were randomly assigned to one of the two groups (control and experimental groups) 8 players per group. The findings indicate that the preventive exercises do make a contribution to developing these muscle groups surrounding the knee joint, so as to prevent injuries in the future.

Farah Essam Abdulameer and Ali Shaboot Ibrahim (2023): A study was by titled, "The Effect of Preventive Exercises on the Range of Motion in Spinal Flexibility in Less Than 20 Year Old Squash Players." This research was conducted to determine the magnitude of spinal flexibility and difference of changes between before- (pretest) and after-training (post-test assessment) players 6 squash under 20 years. The experimental method was used. The sample was composed of 12 squash players under 20 years, who accounted for 100% of the research population in the sports season (2022–2023), through a sense-population determination. The findings evidenced substantial treatment effects in favor of posttests because of the preventive exercises designed for that purpose. Thus, they suggested that more studies should be performed in this sport and preventive measures should be given priority to avoid the lower back injuries which represent one of most frequent injuries.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Research Scope

- **Human scope:** The study was conducted on a sample of (54) first-year female students from the College of Physical Education and Sports Sciences for Women, distributed across Sections (A), (B), and (C).
- **Spatial scope:** Pre- and post-tests and measurements were implemented at the College of Physical Education and Sports Sciences for Women.
- **Temporal scope:** The pilot study was conducted on 12/10/2024 – 11/2025.

Research Procedures

Research Method

The experimental method was used by the researcher because it was most appropriate for the study. There were two groups that involved the use of a pre-and-post measurement with random assignments and an experimental group and control group.

Research Population and Sample

Research Population

The sample of the study was drawn as a first-year female student `s population in college of Physical Education and Sports Sciences for women divided into three sections: A with (10) students, B with (21), and C with 23).

Research Sample

The researcher used comprehensive enumeration method for the selection of sample, which was included by (54) female first year students from College of Physical Education and Sports Sciences for Women distributed into Section (A) with (10) students, Section (B) with (21) students, and section(C) with (23) students. The sample was split into;

- **Pilot study sample:** Section (A), consisting of (10) students, was selected as a pilot sample to standardize the tests used in the study.
- **Control group:** Section (B), consisting of (21) students, was selected as the control group.
- **Experimental group:** Section (C), consisting of (23) students, was selected as the experimental group.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 1. Numerical distribution of the research sample

Classification	Number of Students	Percentage
Pilot sample	10	18.52%
Main sample – Control group	21	38.89%
Main sample – Experimental group	23	42.59%
Total sample size	54	100%

Statistical Description of the Research Sample

The basic data (age, height and weight) of the sample in this study is also measured, so as to control factors that might have an influence on science research. Table (2) below provides for the sample statistical characteristics of these variables before the experiment.

Table 2. Statistical indicators of the research sample in the basic variables before the experiment (N = 54)

Variables	Unit of Measurement	Mean	Median	Standard Deviation	Skewness	Kurtosis
Age	Year	20.17	20.00	0.83	0.09	-0.23
Height	cm	159.86	160.00	1.95	-0.41	-0.51
Weight	kg	60.82	61.50	2.02	0.29	0.74

It is clear from Table (2) that exhibits the homogeneity for the research sample in relation to the basic preliminary measurements that are normally distributed except that they are also not diffused and centered around same mean value for all sample data. The skewness varied from (−0.41 to 0.29) that is near to zero, indicating normal distribution. Kurtosis values ranged from −0.51 to 0.74, indicating a normal and moderate distribution curve which is neither too peaked nor actually flat. This validates that the research group members are similar in the initial variables previous to conducting the experiment.

Tools and Methods of Data Collection

The researcher relied on a set of supporting tools appropriate to the nature of the work, particularly Arabic and foreign references, scientific journals, and the Internet.

Devices and Instruments Used in the Research

The devices and instruments that contributed to completing the research procedures and achieving its objectives included:

- Rest meter for measuring body height to the nearest centimeter
- Calibrated medical scale for measuring weight to the nearest kilogram
- Dumbbells with different weights

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Whistle
- Lenovo computer
- Electronic calculator
- Tennis balls
- Training cones
- Plyometric boxes of different heights
- Resistance bands
- Measuring tape (0–2000 cm)
- Stopwatch accurate to 0.01 second
- Recording forms

Measurements and Tests Used in the Study

The investigator has reviewed literature of references and studies, as well as scientific research concerning variables related to health-related physical fitness. These factors were brought to the attention of a group of six experts in measurement, evaluation, training, and rehabilitation to define if they would be appropriate for this study. According to the opinions of experts, variables with less than 80% approval were removed. Therefore, health related fitness variables used in the study were:

No.	Health-Related Fitness Variables	Tests
1	Speed–strength	Two-leg hopping test for maximum distance in 10 seconds
2	Agility	Agility T Test
3	Coordination	Ball throwing and catching test
4	Balance	Static balance test on the forefoot

Description of the Tests

Two-Leg Hopping Test for Maximum Distance in 10 Seconds

- **Test name:** Maximum hopping distance in 10 seconds
- **Purpose:** To measure speed–strength of the legs
- **Equipment:** Stopwatch, whistle, measuring tape, recording form
- **Procedure:** The participant stands behind a marked line. Upon hearing the whistle, she hops with both legs as quickly as possible.
- **Scoring:** The distance covered within 10 seconds is recorded. Only one attempt is allowed (Hassanein, 2004, p. 65).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Agility T Test

- **Purpose:** To measure agility
- **Equipment:** Whistle, six cones, stopwatch
- **Procedure:** The participant runs 10 meters forward from the starting point, moves 5 meters to the right, then 10 meters to the left, followed by 5 meters back toward the starting point, finishing by crossing the start line.
- **Scoring:** The total time taken to complete the test is recorded (Pauole, 2000).

Ball Throwing and Catching Test

- **Purpose:** To measure eye–hand coordination
- **Equipment:** Tennis balls
- **Procedure:** A line is drawn 5 meters from a wall. The participant stands behind the line and throws balls at the wall as follows:
  - Five consecutive throws with the right hand and catches with the same hand
  - Five consecutive throws with the left hand and catches with the same hand
  - Five consecutive throws with the right hand and catches with the left hand after rebound
- **Scoring:** One point is awarded for each successful attempt; the maximum score is 15 points (Al-Fartousi & Jaafar, 2015, p. 23).

Static Balance Test on the Forefoot

- **Purpose:** To measure static balance while standing on the forefoot
- **Equipment:** Stopwatch or wristwatch with seconds hand, recording form
- **Procedure:**
  - The participant stands on one foot (preferably the take-off foot).
  - The other foot is placed on the inner side of the knee of the supporting leg, with hands on the waist.
  - Upon the signal, the participant lifts the heel off the ground and maintains balance as long as possible without moving the foot or touching the heel to the ground.
  - The test is performed barefoot, and hands must remain on the waist.
  - The test ends when balance is lost or the heel touches the ground.
  - Three attempts are allowed.
- **Scoring:** The best time of the three attempts is recorded, from lifting the heel until loss of balance or heel contact (Hassanein, 2004, p. 59).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Pilot Study

The pilot study was taken place on the pilot sample and out of the main sample from 17/11/2024 to 19/11/2024. It aimed to check compatibility of the tests, confirm validity of equipment and instruments used, find most suitable procedure/s used in measurement process, train collaborators for the collection of exercises described in this study, detect if there were any weakness concerning equipment and procedures proposed, adapt level of difficulty and execution fitness for the proposed exercises.

Form for Identifying the Most Common Injuries

The researcher also prepared a questionnaire to discover the most reoccurred injuries in the first year female students of college of physical education and sport sciences. The instrument was used in the entire sample, and injuries more frequently reported were as follows:

- Knee joint injuries
- Ankle joint injuries
- Foot injuries
- Shoulder injuries

Based on these findings, preventive exercises were developed accordingly.

Preventive Exercises Using Different Weights

While strength and stability exercises utilizing different weights are designed to increase muscular strength and balance as well as stability for the prevention of exercise-related or sport-induced injuries, particularly knee, ankle and shoulder injuries. These are the same type of exercises used in sports rehab and core strengthening. The exercises were determined by the researcher and reviewed by experts in biomechanics, assessment/evaluation, rehabilitation and fitness professionals in experts based on the first-year female college students.

Implementation of Preventive Exercises

The preventive exercises were applied regularly during the week as follows:

- Number of weekly training sessions: 2 sessions
- Duration of the program: 12 weeks
- Duration of each session: 30 minutes
- Training days: Sunday and Tuesday

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Main Study

The main study was conducted from 10/11/2024 to 11/2/2025.

Pre-test Measurements

The pre-measurements were performed on the research sample (44 students) in the fitness hall at the College of Physical Education and Sports Sciences for Women – Baghdad, The College of Physical education for women/Baghdad University, by the help of a supporting team, from Sunday 10/11-/2024 to Tuesday[12/11-/2024(For study variables Pre-measurements were also applied.

Table 3. Equivalence between the control and experimental groups in the pre-tests before the experiment

Abilities	Tests	Unit of Measurement	Control Group (n = 21) Mean	SD	Experimental Group (n = 23) Mean	SD	t-value	Significance Level
Speed–strength	Two-leg hopping test for maximum distance in 10 seconds	Meter	6.12	1.52	6.19	1.36	0.91	0.38
Agility	Agility T Test	Second	15.688	1.31	15.83	1.29	1.02	0.80
Coordination	Ball throwing and catching test	Score	6.28	1.52	6.41	1.23	1.26	0.56
Balance	Static balance test on the forefoot	Second	22.63	1.63	21.96	1.14	1.39	

It could be seen from Table (3) which describes the statistical means and values of health-related fitness variables for experimental and control group before taking the experiment that there was no significant difference at significance level 0.05 between both beams. The computed t-value values (0.49–1.39) were all smaller than the tabled one at 0.05 significance level, =2.018 with significance levels greater than 0.05. This suggests that the two groups were similar to each other prior to experimentation.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Implementation of Preventive Exercises

The preventive exercises were administered to the experimental group, which included (23) female students compared with (21) in the control group as a regular program. The preventive program presented in the experimental group has been conducted during 12 weeks two times a week on subject's own samples.

Post-Test Measurements

Follow-up measurements of the study variables were performed on the research sample from 12/2/2025 to 13/12/2025 at College of Physical Education & Sports Sciences for Girls, and after twelve weeks of applying prevention exercises with a duration of twenty-four training sessions.

Statistical Treatments Used

- Arithmetic mean
- Standard deviation
- Median
- Skewness coefficient
- Kurtosis coefficient
- t-test
- Pearson correlation coefficient
- Frequency and percentage

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Results

Table 4. **Statistical significance of the differences (t-test) between the pre- and post-measurements in health-related fitness variables for the control group (N = 21)**

Abilities	Tests	Unit	Pre-test Mean	SD	Post-test Mean	SD	t-value	Significance
Speed–strength	Two-leg hopping for maximum distance in 10 s	m	6.12	1.52	7.12	1.36	*2.16	0.042
Agility	Agility T Test	s	15.688	1.31	13.92	0.98	*3.10	0.000
Coordination	Ball throwing and catching	score	6.28	1.52	8.92	1.47	*4.51	0.000
Balance	Static balance on forefoot	s	22.63	1.63	25.78	1.25	*4.39	0.000

t-value at (0.05) = 2.086

Table 5. **Statistical significance of the differences (t-test) between the pre- and post-measurements in health-related fitness variables for the experimental group (N = 23)**

Abilities	Tests	Unit	Pre-test Mean	SD	Post-test Mean	SD	t-value	Significance

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Speed–strength	Two-leg hopping for maximum distance in 10 s	m	6.19	1.36	8.79	0.94	*3.87	0.000
Agility	Agility T Test	s	15.83	1.29	10.38	1.64	*10.74	0.000
Coordination	Ball throwing and catching	score	6.41	1.23	13.83	1.86	*13.69	0.000
Balance	Static balance on forefoot	s	21.96	1.14	33.46	1.25	*9.62	0.000

t-value at (0.05) = 2.074

Table 6. **Statistical significance of the differences (t-test) in post-measurements of health-related fitness variables between the control and experimental groups**

Abilities	**Tests**	**Unit**	**Control Group Mean**	**SD**	**Experimental Group Mean**	**SD**	**t-value**	**Significance**
Speed–strength	Two-leg hopping for maximum distance in 10 s	m	7.12	1.36	8.79	0.94	*2.46	0.000
Agility	Agility T Test	s	13.92	0.98	10.38	1.64	*6.11	0.000
Coordination	Ball throwing and catching	score	8.92	1.47	13.83	1.86	*8.05	0.000

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Balance	Static balance on forefoot	s	25.78	1.25	33.46	1.25	*7.42	0.000

t-value at (0.05) = 2.018

Discussion

The first null hypothesis proposed that no significant differences exist between the pre- and post-test performances of the control and experimental groups on the health-related fitness variables identified above as well as certain motor abilities.

Table (4) and Table (5) results also indicated improvement in both groups, all measured differences were statistically significant in favor of posttest assessment. Nevertheless, the experimental group showed greater progress in all variables (speed–strength, agility, coordination and balance), which suggests that the preventive exercises with different weights were effective.

This improvement resulted from the systematic preventive training program that was aimed at the strengthening of muscles, neuromuscular coordination, and balance as well as joint stability mainly knee, ankle and shoulder joints. Such findings are in agreement with both motor learning and training principles, which emphasize forward overload, resistance variation, and movement pattern specificity for optimal development of physical fitness components while minimizing injury risks.

These findings were corroborated by the study of Hamdi Abdelrahim (2024) that found explosive strength training to be the most effective elements in the reduction of lower limb injuries; followed by eccentrics, balance and agility. Also, Farah Essam Abdulameer and Ali Shaboot Ibrahim (2023) reported significant differences between the pre-tests and post-tests in favor of the post-testing as a result of prophylactic exercises. Mahmoud Abdelrahman Hamed (2022) also witnessed improvements in physical abilities and skill performance of young goalkeepers after 12-week step-box training. Mahmoud Abdelrazek Bayoumi (2022) also stated that preventive programs which combine muscular strength and flexibility training through isokinetic techniques will have a positive effect on the shoulder joint stabilization and in reduction of injuries.

The second hypothesis stated that there are no statistically significant differences between the experimental and control groups in the post-tests of the health-related fitness variables.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Results of Table 6 demonstrated the statistically significant differences in all variables towards experimental groups in favors of preventive exercises with different weight when compared to the traditional program done by the control group. The experimental intervention for the improvement of speed–strength, agility, coordination and balance were characterized by controlled possibility of exercise progression based on specific tasks aimed at increasing neuromuscular efficiency and joint stability.

These results correspond with the research of (Gaith Hamed Shaker and Haider Jumaa Asri, 2024) in which it is also proved that preventive exercises improved the muscles surrounding to knee joint and decreased proneness to injury in future. Similarly, Mustafa Hamid Wroor, & Shaimaa Reda Ali (2022) reported very significant scoliosis enhancement and physical skills as a result of preventive application rather than traditional workout. Also, Mohammed Saad Ismail and others (2022) the experimental group and control group in post-tests for balance, ankle flexibility, and strength had significant differences.

Overall, the results confirm the effectiveness of preventive exercises using different weights in improving health-related fitness components and reducing the risk of injuries among first-year female students in the College of Physical Education and Sports Sciences.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Conclusions

In light of the research objectives, hypotheses, sample, methodology, and the statistical analyses and results obtained, the researcher reached the following conclusions:

- The experimental group achieved statistically significant improvement in the health-related fitness variables (speed–strength, agility, coordination, and balance). This improvement is attributed to the implementation of preventive exercises using different weights targeting the specific muscle groups proposed by the researcher.
- The experimental group outperformed the control group in the health-related fitness variables (speed–strength, agility, coordination, and balance), which is due to the application of the preventive exercise program using different weights on the experimental group.

Recommendations

Based on the results and conclusions of the study, and within its scope, the researcher recommends the following:

- Extrapolating from the content of preventive exercises by variable load, as with predictable efficacy in increasing specific health components.
- Increasing faculty awareness of prevention training devices and application for effective use to physically prepare students and serve as their injury prevention during activity or physical performance.
- Emphasizing the development of basic physical capacities with students as a strategy to prevent injuries by programming training that addresses fitness components linked to injury prevention.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The Role of Polar Device in Improving Sports Training A Field Study: Joya Sports Club in Southern Lebanon

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Abstract

This study aimed to analyze the scientific and practical role of the Polar device in improving the training process at Joya Sports Club in Southern Lebanon, emphasizing the importance of keeping pace with technological advancements in sports training. The study's significance lies in bridging the gap between traditional practices and data-driven training, providing an applicable model for emerging Arab clubs to emulate. The study adopted a descriptive-analytical approach, collecting data through semi-structured interviews with a sample comprising the technical staff, players, and management of the club. The results revealed a radical shift in training methodology, where the device's data contributed to personalized training programs, improved physical fitness indicators (endurance, speed, strength), and reduced injury rates through proactive management of training load and recovery. The results also highlighted organizational and financial challenges that were overcome by demonstrating the technology's feasibility.

Keywords: polar device, sports training, technological improvement, joya club, physical fitness, sports injuries.

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https://jcope.uobaghdad.edu.iq

Introduction

Modern sports training represents a fundamental pillar for developing performance and achieving accomplishments. It no longer relies solely on physical effort and traditional planning but has become a science based on accurate measurement and objective data. In this context, modern technologies and devices have emerged as effective tools for enhancing training efficiency. Among the most prominent of these devices are those produced by Polar, a leader in monitoring cardiac and physical activity. These devices provide instant and accurate data on heart rate, training load, and recovery levels, enabling coaches to optimally tailor programs and reduce the risks of fatigue and injury.

On the local level, the sports scene in Lebanon is witnessing notable transformations, with ambitious clubs adopting modern methodologies to compete at the highest levels. Joya Sports Club in Southern Lebanon is a living example of this trend, having achieved an inspiring journey by rising to the Lebanese Premier League, marking itself as one of the rising and surprising teams. This success did not come out of nowhere but was the result of organized collective effort, competitive spirit, and a ambitious vision embracing continuous development. The club's achievement, from promotion to a strong start in the current season, raises a fundamental question about the tools and methodologies it relied on to achieve this qualitative leap.

Therefore, this study sheds light on the intersection of advanced sports technology and the ambitions of rising clubs by focusing on the role of Polar devices in improving the training process at Joya Sports Club. It examines how this technology contributed to enhancing players' physical readiness, improving training session planning, managing loads accurately, and preventing injuries, positively reflecting on the team's collective and individual performance.

This study aims to analyze the scientific and practical impact of adopting this technology in an ambitious Lebanese sports environment like Joya Club, seeking to present a model that many local clubs can benefit from in their journey toward development and competing at the top.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Study Objectives

- **Main Objective:** To analyze and evaluate the scientific and practical impact of using Polar devices on improving the overall training process at Joya Sports Club.
- **Sub-Objectives:**
    1. Monitor and enhance the efficiency of training planning based on quantitative data provided by the devices.
    2. Measure the development in players' physical and technical levels resulting from the regular use of the technology.
    3. Develop effective strategies for managing training loads and preventing injuries.
    4. Identify obstacles and costs associated with the technology's application to provide practical recommendations.
    5. Present a guiding model (Case Study) that emerging Lebanese and Arab clubs can emulate.

Importance of the Study

- **Scientific Importance**
    - Enriching Arabic sports literature with applied studies on the use of technology in sports training.
    - Providing practical evidence (Empirical Evidence) supporting theories promoting data-driven training.
- **Practical Importance**
    - For Joya Sports Club: Offering an objective evaluation of the effectiveness of its modern tools, helping optimize resources and make more informed decisions for the future.
    - For researchers and coaches: Providing a practical framework for integrating technology like Polar into training plans.
    - For Lebanese federations and clubs: Encouraging the adoption of modern scientific methodologies to elevate local sports and enhance regional and international competitiveness.

Study Problem

Modern sports training is undergoing a radical shift towards reliance on technology and accurate data to improve performance. Despite Joya Sports Club's remarkable rise and achievements in a record time, there remains a need to understand the scientific

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

mechanisms and tools it relied on to achieve this qualitative leap. The study's problem lies in questioning the effectiveness of adopting advanced technologies like Polar devices in improving the training process within emerging sports clubs in Lebanon, which often face challenges in resources and expertise. This study aims to systematically examine this relationship to determine the extent of this technology's contribution to developing physical and technical performance and competing at the highest levels.

The main research question derived from this problem is: What role do Polar devices play in improving the training process at Joya Sports Club?

Sub-Questions

1. How did Polar data (heart rate, training load) contribute to planning daily and weekly training programs for the team?
2. What is the impact of using these devices on developing players' basic physical elements (e.g., strength, endurance, speed)?
3. How did the data extracted from the devices help manage player fatigue and reduce the risk of injuries?
4. What are the challenges and costs associated with implementing this technology from the perspective of the club's management and technical staff?
5. How do players and the technical staff evaluate the effectiveness and ease of use of Polar devices in improving their individual and collective performance?

Study Hypotheses

- **Main Hypothesis:** There is a statistically significant role of using Polar devices in improving the training and physical performance level of Joya Sports Club players.
- **Sub-Hypotheses**
    1. There is a positive statistically significant correlation between using Polar data in training planning and increasing the accuracy and efficiency of training programs.
    2. Relying on Polar devices significantly improves physical fitness indicators (endurance, strength, speed) among the club's players.
    3. Analyzing recovery and stress data through the devices reduces the injury rate among players.
    4. There are logistical (organizational) and financial challenges affecting the degree of effectiveness of implementing this technology in the club.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Methodology

The study relied on the descriptive-analytical method, suitable for the nature and objectives of the research. This approach is based on describing the studied phenomenon (use of Polar devices) and analyzing it objectively to understand the relationships between variables.

- **Practical Application:** The study describes the reality of using Polar devices at Joya Club by collecting field data.
- **Analysis:** The data were analyzed to determine the impact and relationships, such as the relationship between data usage and reduced injury rates or improved physical fitness.

Research Population and Sample

- **Research Population:** Includes all individuals at Joya Sports Club directly related to using Polar device data and applying it in the training process, consisting of:
    1. Technical Staff: (Head coach, assistant coaches, fitness trainer, physical therapist).
    2. First-team players: Those who use the devices regularly during training and matches.
    3. Sports Management: (Director of football or official in charge of equipment and analysis).
- **Research Sample:** Due to the small size of the original population, the study relied on a **comprehensive census method**, including all population members who agreed to participate, to ensure representation of all perspectives (technical, practical, administrative).

Study Tool

The study tool consisted of semi-structured interviews as the main method for collecting qualitative data.

- **Justifications for Selection**
    - Allows obtaining rich and in-depth data from experts and specialists within the club.
    - Provides flexibility enabling the researcher to follow up on ideas and clarify responses.
    - Suitable for the small and specialized sample nature.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- **Tool Application**

    1. An interview guide was prepared including a set of main and open questions covering all research axes (planning, physical performance, injury prevention, evaluation, and challenges).
    2. Interviews were conducted face-to-face or via visual communication means with sample members, with responses recorded after obtaining consent.
    3. Qualitative analysis techniques were used to analyze interview texts, by coding responses and classifying them into main themes consistent with the study's objectives and questions.

Study Limitations

The study's results and applications are limited by the following:

- **Geographical Limit:** The sample was limited to players of Joya Sports Club in Southern Lebanon only.
- **Time Limits:** The study was conducted during the 2024-2025 training season.

Theoretical Framework of the Study

Concept of the Polar Device

The Polar device is an integrated system for monitoring human performance and smart training, specifically designed to analyze the body's physiological responses during physical activity with high scientific accuracy (Alberto, 2019, p. 23).

This system operates through two main components (Alexander, Silva, Wong, 2012, p. 34):

1. A wireless sensor (chest strap) worn around the chest to monitor the electrical signals of the heart (ECG) with medical precision.
2. A receiver (watch or smartphone application) that receives data from the sensor and displays it in a simplified and clear manner for the coach or player.

Functionally, the Polar device can be described as a "personal heart and effort monitor" during training. It goes beyond merely providing a random heart rate number; it analyzes heart rate patterns, their response to effort, and recovery speed, transforming this complex data into practical, applicable information that aids in making immediate and informed training decisions.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Operation of the Polar Device

The device operates on the principle of Continuous Bio-Monitoring, which involves:

- **Monitoring:** Capturing basic physiological signals (heart rate).
- **Analysis:** Processing these signals using advanced computer algorithms.
- **Interpretation:** Converting them into understandable performance indicators (such as effort intensity, recovery status, and training zones).
- **Feedback:** Providing instant and historical reports on player performance.

In short, the Polar device is the coach's eye into what cannot be seen inside the player's body. It is the bridge connecting the apparent effort exerted on the field with the actual response of the body's internal systems, transforming training from mere exercise repetition into a precise, data-driven scientific process.

Importance of the Polar Device

The importance of the Polar device lies in its role as an objective tool linking the player's apparent effort to their actual physiological performance, achieved through (Amri, Kasim, Paulo, 2017, p. 87):

1. Providing accurate digital measurements of pulse rate and blood pressure, reducing the margin of error in performance evaluation.
2. Enabling real-time monitoring of players' physiological responses *during* performance, allowing coaches to make immediate decisions.
3. Helping identify early signs of overtraining by monitoring indicators like abnormal recovery rates, thus allowing for training load adjustments to prevent injuries.
4. Providing reliable data suitable for experimental studies comparing pre- and post-measurements with high statistical accuracy.

Objectives of Using the Polar Device

The use of the Polar device aims to achieve tangible goals in the training process, namely (Antonio, 2011, p. 87):

1. Monitoring heart rate during both rest and exertion, the primary indicator of training load intensity.
2. Calculating advanced indicators such as:
    - Percentage of Maximum Heart Rate (%HRMAX)
    - Target Heart Rate (HR RESERVE)

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Percentage of Target Heart Rate (%HR RESERVE) These are vital indicators for determining if a player is working within the required training intensity zone.

3. Measuring the improvement in cardiovascular efficiency by tracking enhanced recovery rates and decreased resting heart rate after exertion.
4. Designing individualized training programs based on the actual physiological capacities of each player, rather than on general averages.

Need for Using the Polar Device

The need to use the Polar device emerged as an inevitable result of the evolution of sports training science, where traditional observation is no longer sufficient, for the following reasons (Ermanno, 2007, p. 76):

1. An urgent need to replace estimation and observation methods in determining training intensity with accurate measurement tools.
2. Particularly for younger age groups (under 15 years), whose physiological capacities vary significantly. The device helps protect them from excessive loads and optimally direct their energies.
3. The use of technology in monitoring and analysis has become a fundamental feature of modern training.
4. The need to "standardize small-sided games based on junior capabilities." The Polar device provides the scientific data necessary for this standardization.

Concept of Sports Training

Sports training is a systematic and planned educational process based on scientific foundations, aiming to comprehensively prepare an individual (physically, skillfully, strategically, and psychologically) to reach their highest possible performance level (Khoulah, 2021, p. 32).

It is not merely about performing random exercises but is an integrated system encompassing planning, organization, implementation, and evaluation.

Objectives of Sports Training

The objectives of sports training can be classified into several levels (Morad, 2019, p. 24):

1. **Physical and Skill Objectives (Comprehensive Development):**
   - Developing physical attributes: such as strength, endurance, speed, and agility.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Acquiring and developing sports skills.
- Achieving the highest performance level.

2. **Educational and Behavioral Objectives:**
   - Improving behavior and discipline.
   - Promoting values: such as discipline, honesty, sportsmanship, and self-reliance.
   - Fostering motivation and positive competition.
3. **Health and Functional Objectives:**
   - Enhancing body system efficiency.
   - Achieving physical adaptation to training demands and stresses.
4. **Psychological Objectives:**
   - Boosting self-confidence and willpower.
   - Learning to handle pressure and responsibility.

Importance of Sports Training

The importance of sports training lies in its role as the cornerstone for developing sports and athletes, achieved through (Khaled, 2024, p. 4):

- Transforming potential into achievements.
- Ensuring comprehensive and balanced development.
- Saving time and effort through optimal use of training time.
- Preventing injuries through proper scientific training.
- Preparing players psychologically to face competition pressures.

Need for Sports Training

The need for systematic sports training emerged as an inevitable necessity for the following reasons (Yaqoob, 2020, p. 32):

- Specialization and the rising level of competitions.
- Leveraging scientific progress by integrating various sciences into the training process.
- Accounting for individual differences among players.
- Ensuring organization and continuity for sustainable development.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Achieving long-term goals for clubs and national teams.

Relationship Between the Polar Device and Improved Sports Training

The relationship between the Polar device and improved sports training is reciprocal, embodying the modern shift from training based on estimation and observation to data-driven, scientifically precise training.

The Polar device enables coaches to design customized training programs that suit each player's individual capacities. Its strength lies in its ability to turn training into a dynamic process adjustable based on real-time physiological data.

In the long term, using Polar helps build a historical database of player performance, enabling the tracking of physical fitness development and the improvement of cardiovascular efficiency. Thus, the device not only enhances sports performance but also acts as a preventive tool, extending players' athletic careers.

Overview of Joya Sports Club

Joya Sports Club is an ambitious Lebanese club located in the town of Joya, Tyre District, Southern Lebanon. The club serves as an inspiring model for rising clubs that have managed to write a remarkable success story in record time.

Key Milestones

- **Remarkable Promotion:** Achieved promotion to the Lebanese Premier League.
- **Surprise of the Season:** Established a strong presence in the premier league with a powerful start.
- **Record:** Became the second-fastest team in the league's history to score 5 goals in its first season.

Keys to Success

- **Teamwork:** Relied on team spirit and collective effort.
- **Technology Adoption:** A pioneer in Lebanon in adopting modern technological tools like Polar for physiological monitoring.
- **Ambitious Management Vision:** Plans to expand technology use and integrate systems like GPS and video analysis.

Social Context

The club enjoys strong support from the local community and is associated with businessman Wissam Saad, known for his social and humanitarian support in Lebanon.

Analysis of Interview Questions

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Question 1: What specifically motivated Joya Club to adopt technology like Polar devices in its training programs? What fundamental needs did it address?

Analysis of the responses reveals that the primary motivation was to move beyond traditional and random observation methods. The club was no longer satisfied with general estimates of player effort levels but sought accurate, data-based measurements. The urgent need was to transform training from an art relying solely on intuition and experience into a science based on numbers and objective data. The device was adopted not merely to follow technological trends but to fill a real gap in monitoring and evaluation processes. It provided tools to measure actual rather than apparent effort, determine each player's true endurance capacity, and establish a scientific basis for adjusting training intensity according to each player's individual potential.

Question 2: How do you define the Polar device from a training perspective? What are the main functions coaches at the club primarily rely on?

The responses clarify that the definition transcends being merely a measurement tool, elevating it to a decision-making aid. It is a system that gives the coach a "broader" and clearer view of the player's physical condition, enabling them to direct training based on confirmed information rather than expectations. The primary functions coaches relied on, such as monitoring heart rate, intensity levels, and recovery rates, were not ends in themselves but means to achieve a greater goal: transforming training from a general collective process into precise individual management for each player within the team.

Question 3: How did the data provided by the Polar device help design more personalized training programs for each player?

The analysis indicates that the data caused a radical shift in planning philosophy. The club moved from a "one-size-fits-all" model to a "tailored-to-measure" model where each player had their own program. Programs were no longer designed assuming all players had the same endurance capacity or response speed. Heart rate data revealed actual effort, training load data mapped precise work volume, and recovery data determined energy restoration speed. These combined elements transformed the coach from a general planner into an engineer managing each player's physical resources separately to achieve maximum efficiency for the team as a whole.

Question 4: Can you give a concrete example of how coaches changed an exercise or training session in real-time based on direct readings from Polar devices?

The mentioned example illustrates that the technology gave coaches the ability for "biological and direct control" over the training session flow. They transitioned from external observers to active managers on the field. The ability to instantly detect a player exceeding the maximum intensity zone and reduce their load, request increased speed from

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

the entire team when readings were below target, or adjust rest periods for a specific player during interval training are all live examples of how data transformed into immediate training commands. This highlights how data ceased to be just post-exercise reports and became live signals guiding player performance moment-by-moment.

Question 5: How did using data affect dealing with individual differences among players?

The analysis reveals that the technology contributed to achieving the principle of "training justice" based on efficiency rather than formal equality. Instead of treating all players the same way – which could disadvantage the proficient and overburden the less fit – the data enabled the coach to achieve positive differentiation. It became possible to reward the strong player with a training load matching their potential to push them to their limit, while simultaneously protecting the less fit player from excessive load that could lead to injury or exhaustion. This approach not only improved individual efficiency but also reinforced trust among players, as they realized treatment was based on objective and fair criteria.

Question 6: What specific indicators or data did you observe that were directly linked to improved athletic performance in players?

The responses show that performance improvement was not general or subjective but measurable and identifiable through clear quantitative indicators. Improved ability to control heart rate during effort indicates better cardiorespiratory efficiency. Spending more time in high-intensity zones proves developed physical capacity to withstand pressure. Increased speeds and distances covered are tangible results of improved strength and endurance. Most importantly, accelerated recovery rate is definitive evidence of comprehensive physical fitness improvement, indicating the body's enhanced ability to restore its normal state effectively and efficiently after exertion.

Question 7: How did monitoring heart rate and effort metrics help prevent player fatigue

The analysis highlights the "proactive" role technology played in managing players' physical health. Instead of waiting for clear signs of fatigue or actual injury, it became possible to detect early warnings. When a coach observes that a player's heart rate isn't returning to its normal level during rest periods as expected, it signals that the body hasn't fully recovered and needs more rest. This predictive and early detection capability prevented fatigue accumulation, protecting players from entering the chronic fatigue cycle that inevitably leads to performance decline and increased injury risk.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Question 8: Did training load data and recovery rates help reduce injury rates among club players? If so, how?

The response indicates the system's success in creating a "dynamic balance" between effort and recovery, the cornerstone of injury prevention. The coach became able to identify the "danger point" where training load exceeds the player's recovery capacity. When this imbalance is detected, the coach immediately intervenes by either reducing intensity or granting additional rest. This proactive mechanism prevents excessive and continuous pressure on muscles and joints, a primary cause of many sports injuries. The result was creating a safer training environment that maintained player continuity in training and matches, a crucial factor for athletic stability.

Question 9: What were the biggest challenges or difficulties faced while implementing this technology?

The analysis reveals that the challenges weren't purely technical but also human and organizational. Beyond the financial challenge of initial cost and maintenance, the "human capital" challenge emerged: the necessity to train coaches not only to operate the devices but to interpret data and integrate it into training decisions. The cultural challenge was also prominent, as the club faced resistance from some players to the idea of constant monitoring, which some interpreted as lack of trust. However, the experiment's ultimate success confirms these challenges are solvable when the technology proves its practical value and transforms from a monitoring tool into an aid for the player themselves.

Question 10: How was data from the Polar device integrated with the coach's traditional observations and insights?

The analysis shows a successful model of integration between "science and art" in training. Data didn't replace the coach's expert eye; both worked in harmony. Polar devices provided the accurate "quantitative picture": numbers and graphs telling the story of physical effort. Meanwhile, the coach's observations added the "qualitative picture": the player's mental state, focus level, tactical commitment, and determination. Combining the strict objectivity of data with the considered subjectivity of human observation produced a comprehensive evaluation focusing not only on the body but also on the mind and spirit, offering a perspective neither method could provide alone.

Question 11: Does the club intend to expand the use of these technologies or integrate them with other types of sports technology in the future?

The response indicates a clear strategic vision for developing the technological system. The club doesn't view Polar as a final solution but as a cornerstone in building an "integrated system" for performance analysis. Plans to integrate with GPS systems for precise movement and distance tracking, and video analysis for understanding tactical

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

aspects, reflect a deep understanding that human performance is multidimensional. Physical fitness (measured by Polar), spatial movement (measured by GPS), and tactical intelligence (revealed by video) are the three sides of the sports success triangle. This integration is the way to create an almost complete picture of the player and the team.

Question 12: Based on this experience, what advice would you give to other clubs, especially in areas where resources might be limited?

The wisdom gained from the club's experience is summarized in the principle of "starting with the necessary and gradual development." The advice isn't to wait for massive financial resources but to start immediately with the simplest tools that give the highest return, such as monitoring training load and recovery. The key isn't owning the technology itself but having the "human competence" capable of extracting value from it. Investing in training coaches to understand and use data is a greater investment than purchasing the devices themselves. Expansion should be natural, stemming from accumulated experience rather than fashion pressures.

Analysis of Study Hypotheses

Main Hypothesis: There is a statistically significant role of using Polar devices in improving the training and physical performance level of Joya Sports Club players.

The evidence extracted from the interviews strongly confirms this hypothesis, as the device's impact was not merely a marginal improvement but represented a radical shift in the club's training philosophy. One participant described it as a "turning point in the way Joya Club players are prepared,". Furthermore, the improvement was not limited to the physical aspect alone; it extended to the team's collective performance, as the system contributed to "enhancing collective performance" by providing a deeper understanding of each player's potential. Tangible evidence confirms this improvement, with observed "increased speed rates," "greater distances covered," and "enhanced ability to sustain high intensity for longer periods." These are all quantitative and qualitative indicators supporting the hypothesis of comprehensive improvement in training and physical level.

Sub-hypothesis (a): There is a positive statistically significant correlation between using Polar data in training planning and increasing the accuracy and efficiency of training programs.

The analysis results clearly support this hypothesis, as training planning transitioned from generality to precise customization. One coach clarified that the data contributed to transforming the training program from being "uniform for everyone" to a program "tailored precisely to the measurements of each player." This customization was not theoretical but manifested in the field through "adjusting exercise intensity according to each individual's capacity" and "balancing increase and decrease" in training load. Moreover, the ability to make instant decisions during the training session, such as

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

"reducing exercise intensity or providing additional rest" when player readings exceed safe limits, shows how the data improved execution efficiency, not just planning. This strong link between data and training decisions created a fairer and more efficient training environment, where each player is treated according to their actual potential and not general impressions.

Sub-hypothesis (b): Relying on Polar devices significantly improves physical fitness indicators (endurance, strength, speed) among the club's players.

A noticeable improvement was observed in all monitored physical fitness indicators. In the area of endurance, the "recovery rate" indicator stood out as clear evidence of improvement, as it was noted that "heart rate drops faster after exertion," a recognized physiological indicator reflecting improved cardiorespiratory efficiency. Also, the "increased ability to sustain high intensity for longer" indicates better muscular endurance and ability to recover within the training session itself. As for speed, a direct "increase in speed rate" was recorded, which is also linked to improved explosive strength. Although strength was not explicitly mentioned, the ability to maintain higher speeds and remain in high-intensity zones necessarily requires improved muscular strength, indicating a comprehensive improvement in the basic physical components of the club's players.

Sub-hypothesis (c): Analyzing recovery and stress data through the devices reduces the injury rate among players.

The evidence for this hypothesis was decisive and direct, as one participant stated that monitoring the data "clearly helped reduce injuries." But more important than the acknowledgment itself is the existence of a clear working mechanism explaining this result, as the participant explained that "when we notice that the training load is higher than the player's recovery capacity, we reduce the intensity or give them additional rest." This proactive mechanism in load management represents the core of injury prevention, as it prevents the accumulation of stress that inevitably leads to injuries. The tangible final result was achieved through "maintaining player continuity in matches with a lower injury rate," confirming that the system did not just provide early warnings but transformed into practical actions that contributed to creating a safer and more sustainable performance environment.

Sub-hypothesis (d): There are logistical (organizational) and financial challenges affecting the degree of effectiveness of implementing this technology in the club.

The analyses revealed the existence of real challenges faced by the club during the implementation phase, represented in three main groups. Financially, the "cost of devices and their maintenance" emerged as the first and biggest challenge, reflecting the financial burden these advanced technologies can represent. Organizational challenges included the need to "train coaches to use them correctly," requiring an additional investment in human

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

capital before fully benefiting from the financial investment. A cultural challenge also emerged, represented in the "difficulty convincing some players of the need to adhere to the technology" initially, as the idea of constant monitoring faced resistance from some players who considered it an intrusion into their performance privacy. Although participants indicated that these challenges "decreased significantly" over time after players and coaches saw the practical benefits, their existence in the early stages undoubtedly affected the degree of application effectiveness and efficiency.

Conclusions

The study demonstrated that the use of the Polar device at Joya Club significantly enhanced training quality by shifting from traditional observation to data-driven, individualized programs, improving players' endurance, speed, recovery rates, and reducing injury incidence. The device provided coaches with objective, real-time insights to adjust training intensity and rest, fostering a fairer and more efficient training environment and promoting a culture of scientific planning. Despite challenges such as financial cost, coach training requirements, and initial player resistance, the implementation proved feasible and effective, showing that even clubs with limited resources can successfully benefit from training technology.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

It is recommended to expand the integration of complementary technologies such as GPS tracking and video analysis, provide advanced training programs for technical and administrative staff, and increase awareness among players and parents regarding the benefits of these technologies. Clubs should allocate budget for technological investment and device maintenance, document experiences for knowledge sharing, regularly monitor the impact of technology on performance, and focus initially on cost-effective device functions with high return. Additionally, enhancing communication between fitness coaches and medical staff, seeking sponsorships or partnerships to reduce costs, standardizing data-driven evaluation criteria, integrating data into talent identification, and encouraging further academic research are advised to maximize the effectiveness and sustainability of technology-driven training programs.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Motor Coordination and Its Relationship to Jump Shooting Accuracy in Handball among Second-Year Students at the College of Physical Education and Sports Sciences

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Abstract

Shooting is considered one of the most fundamental and essential skills in handball, requiring a high degree of accuracy and motor coordination. Based on their teaching experience in the handball course, the researchers observed that some students possess adequate physical strength yet struggle with shooting accuracy. This raises questions regarding the factors influencing shooting performance, including motor coordination. Accordingly, the problem of the current study arises from the need to identify the relationship between the level of motor coordination and the accuracy of jump shooting among second-year handball students. The study aims to reveal the nature of this relationship. The researchers hypothesized that there are statistically significant differences in motor coordination that influence shooting accuracy. The descriptive correlational method was used due to its suitability for the research problem. An intentional sample of 42 students from Section (W) was selected: 30 students for the main sample, 5 for the pilot study, and 7 excluded for non-attendance or previous academic failure. Standardized tests were used, including a motor coordination test and a jump shooting accuracy test. Data were processed using the SPSS statistical package. Results showed a statistically significant correlation between motor coordination and jump shooting accuracy. The researchers recommended incorporating progressively structured motor coordination exercises to improve shooting performance and encouraged conducting similar studies on other skills and sports activities.

Keywords: motor coordination, overhead jump shooting, handball, second-year students.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Lately, the sport sciences have shown significant increase in many sports activities. Many researches have examined motor learning process and development in aiding the enhancement of sport performance. Sports motor learning is the way in which motor skills are learned through practice, repetition and experience, encompasses physical capabilities development, coordination enhancement and behavioral traits related to performance gain.

Motor learning is considered as the relatively permanent process and result of several experiences to obtain, stabilize or perform movements and motor skills and for their use and retention. Motor coordination is one of the basic motor skills to play handball, a sport with many simple and complex technical activities with or without a ball. Wajeeh Mahjoub (2000, 34) described it as "donning of the internal functional and motor complexity with the surrounding environment to secure an intended purpose. Handball is a game that is extremely challenging as it demands high levels of work ethic, synchronization, and focus when developing your foundation skills. The inside coordination and the sequence of these motor skills makes it necessary to use a systematic scientific method in learning them. Motor co-ordination: is important in sports. It is defined as the ability to carry out movements with accuracy this grace and at a minimum of effort than individual adjustments, (Al-Hadithi, 2017, p.45). Jumping throws in handball are not only sports techniques, which demand motor skills and great perception. The influence of motor coordination on this ability has not yet been documented in second year students, which justified the present study. The significance of this study is that --Shooting accuracy in particular and some skills in general- learning basic handball skills needs good enough motor coordination, especially for this learner group.

Shooting is one of the basic skills in handball that involves a great degree of precision and motor control. 'Relating to their experience as handball lecturers (in the college), they realized that some students, despite their power and speed ability, were facing difficulty in achieving a shooting accuracy at the qualitative level. This leads to the question of what might be driving this, including motor coordination. Therefore, the research problem of this study is to determine the link between motor coordination and shot accuracy in high jump shots among handball second-year students.

Research Objectives

1. Identify motor coordination levels among second-year students.
2. Measure the accuracy of jump shooting in handball among second-year students.
3. Determine the relationship between motor coordination and jump shooting accuracy.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Research Hypotheses

There is a statistically significant correlation between motor coordination and jump shooting accuracy.

Research Areas

Human Field: Second-year students, College of Physical Education and Sports Sciences, University of Baghdad.

Time Field: Second semester of the academic year 2024–2025.

Place Field: Indoor handball court, College of Physical Education and Sports Sciences – University of Baghdad.

Methodology

The descriptive correlational method was due to its suitability in determining the relationship between two variables: motor coordination as the independent variable and jump shooting accuracy as the dependent variable among second-year students.

Research Sample

The research population consisted of 579 second-year students (428 males, 151 females). The sample was selected intentionally from Section (W), totaling 42 students: 30 students for the main experiment (5) for the pilot study (7) excluded (6 for poor attendance, 1 due to previous failure).

Devices and Tools

Handball court, Handball goal, 8 handballs, Stopwatch, 7 markers, Fox whistle, Tape measure, Four 60×60 cm scoring squares, Colored tape, Laptop (Dell)

The tests used

1. Motor Coordination Test: Numbered Circles Test

(Mohammed Sobhi Hassanein, 1995)

Purpose: Measure eye–foot coordination

Tools: 8 circles (diameter 60 cm) numbered from 1 to 8

Performance: The student jumps with both feet from circle 1 to 8 sequentially at maximum speed.

Score: Time taken to complete the sequence.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

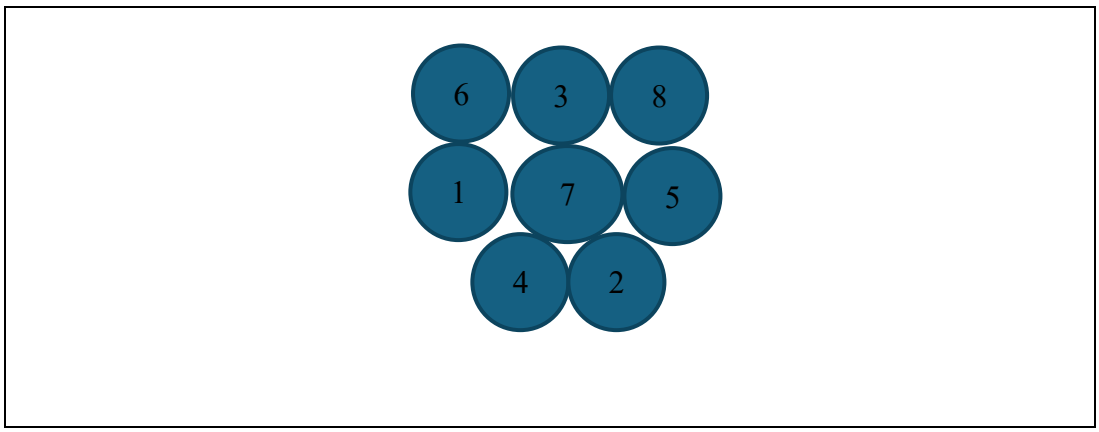

Figure1. *Measuring the coordination between the legs and eyes*

2. Jump Shooting Accuracy Test (Dhiaa Al-Khayyat & Abdulkarim Qasim, 1988)
Purpose: To measure shooting accuracy from a high jump.
Tools: Handball court, handball goal, four (4) 60x60 cm metal shooting accuracy squares, seven (7) stakes, eight (8) regulation handballs, whistle.
Performance: The student stands behind the first stake, positioned vertically towards the goal (1 meter apart). Upon receiving the command, the student dribbles between 7 markers, jumps over a 40 cm barrier, and shoots at four scoring squares placed at the goal's corners. Starting with the top right corner, then the top left corner, then the bottom right corner, and finally the bottom left corner, this is repeated twice.
Test Administration: A recorder calls out the students' names and records the results.
Scoring: Two points are awarded when the ball enters any square, one point when it touches the boundaries of the square, and zero if the ball is outside the square. The total score represents the overall accuracy score for the laboratory, which ranges between (0-16) points, as shown in Figure (2).

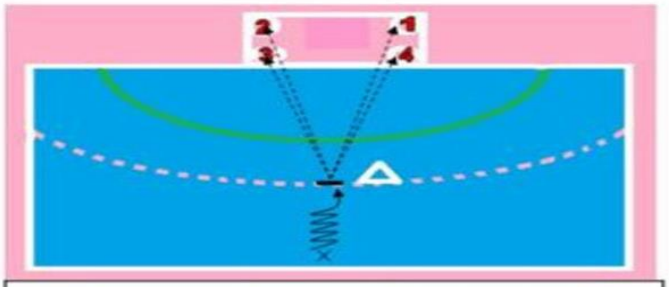

Figure 2. *Demonstrates the test of shooting accuracy from a high jump*

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The Pilot Study

It was conducted on Tuesday, March 4, 2025, at 10:30 AM in the indoor handball hall at the College of Physical Education and Sports Sciences. The pilot study sample consisted of five (5) second-year students from section (W), who were not part of the main research sample. The purpose of the study was to identify any obstacles or challenges the researchers might encounter during their work. This included determining the time required to conduct the research tests (physical and skill-based), assessing the safety and suitability of the equipment and tools used, and confirming the competence and efficiency of the support team and training them on how to administer the tests.

Main Experiment

The main test was conducted on Tuesday, March 11, 2025, at 10:30 AM in the indoor handball hall at the College of Physical Education and Sports Sciences. The sample included (30) students from the second stage, section (W), the research sample, where the sample performed a full body warm-up, and the tests were explained and presented by the two researchers. Afterward, the motor coordination test was carried out for all members of the sample, then the accuracy test of high jump shooting was applied to all members of the sample as well. After that, the raw data were recorded and statistically processed.Post-tests

After completing the main experiment, the post-tests for the research sample were conducted on (15/9/2025) to achieve accurate results, as "one of the most important ways to determine quality is to conduct tests to ensure the validity of the training program" (Lazem, 2005, p.156). The same procedures in terms of time, place, and tools used were adopted, and all conditions surrounding the pre-tests were prepared to avoid variables that could affect the results of the post-tests.

Statistical Methods

The Statistical Package for the Social Sciences (SPSS) was used to perform the statistical analyses and display the results using the following formulas: Mean, Standard deviation, and Pearson correlation coefficient.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Results

Table 1. *Shows The Correlation Between Motor Coordination And Shooting Accuracy*

Tests	Mean	SD	r-value	p-value	Significance
Motor Coordination	11.76	0.95	0.85	0.0001	Sig
Shooting Accuracy	10.47	1.79			

Degrees of freedom = 28, significance level = 0.05

Discussion

Results The time of testing on the motor test of coordination and accuracy of the jump shot in handball were inversely strongly significantly correlated (-0.85). This finding suggests that the fast you pass the coordination test (i.e., the better is your motor coordination), the more accurate will be in shooting performance.

Motor control is a basic constituent that forms the successful performance of complex skills in sports, like handball jump shot, where specific fine neuromuscular coordination between upper and lower extremities is needed.

Abdul Hamid Shawqi (2004) described coordination as "the efficiency to perform an organized movement efficiently by himself, and it is a factor that has a great impact on the player's performance of complex movements in terms of speed and accuracy or reducing the power required for their execution immediately, especially in sports that are able to turn into separate parties using several body parts ". This is in line with the findings of the present study where students with high coordination had more accurate shooting values. The biological relationship between motor coordination and the quality of skill performance is associated with the efficiency of nervous intruction in organizing motor commands. As Nasr al-Din Azzam (2010) argued, “Neuromuscular control of fine motor skills is a critical factor in the performance of high accuracy-requiring skills such as shooting in team sports. It's why the study found such a striking correlation: The faster players performed on their coordination test, the more accurate they were in shooting.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The findings of this study are in agreement with:

1. The study by Hussein et al. (2017) concerning handball, reported a strong relationship of some offensive skills with motor coordination, namely that applied to shooting and passing.
2. A direct link was also evident between motor coordination and accurate shooting by middle school handball students in the research by Ali Al-Jubouri.(2015)

Abdul-Hadi Mansour's study (2019) revealed that motor coordination is one of the strongest predictive factors to success in performing accurate skills in team sports, mainly under pressure or movement conditions.

In essence, findings support that motor coordination has an influential effect for providing the fundamental base of developing difficult skills as jump shooting. Well, Better coordination results in better shooting.

Conclusions

1. There is a significant negative correlation between motor coordination time and shot accuracy. The time that the motor coordination test was performed in (the less time spent on time), and arrow of jumping shot accuracy is increased in order to perform quickly.
2. Motor coordination is an immediate inducer, which contributes to the accuracy of jump shot in handball and also gives a clue about the association between fundamental motor abilities and technical skill.
3. Highly motor coordinated spanning students can execute the fine and intricate movements necessary for jump shooting.
4. Proof of the beneficial effect of developing motor coordination is readily apparent in accuracy related skill performance, particularly for demanding skills which require intense concentration and neuromuscular control.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Recommendations

1. Prioritize the motor coordination training in handball skills in university teaching and practice courses, particularly for beginners learning basic handball techniques.
2. Include motor coordination tests as a component of the student´s abilities performance assessment and relate outcomes to an improvement strategy or learning plan.
3. Include certain exercises approximately enhancing motor coordination (working sessions, balance dimensional and perception kinesthetic) in lessons/teaching units (technical as well as physical).
4. Try to find exercises that include motor control and precision so they improve the performance in skills like shooting when jumping.
5.Replicate such studies for other determinants (e.g., balance, agility, and visual–motor perception) that may influence skill performance in handball.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The organizational climate and its relationship to total quality management among secondary school principals in Baghdad province from the perspective of their teachers

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Abstract

Researchers have shown considerable interest in the idea of organizational climate because of its crucial role in school administration and all school operations. Hence, enhancing it is regarded as a primary duty of school principals, as they bear direct accountability for overseeing the school and its entire operations. Total quality management is a primary method that allows the school administrator to effectively handle administrative tasks with the goal of meeting the needs of instructors, students, staff members, and the community. The significance of the research rests in its attempt to shed light on the value of both organizational climate and total quality management among high school principals. The research seeks to determine the various aspects of the prevailing organizational climate in high schools, including organizational structure, leadership, employee engagement, communication, nature of work, technology, human resources, and job autonomy. The objective is to determine the many aspects of total quality management (including education and quality values, enhancement of the educational process, developing evaluations and incentives, school leadership, and decision-making) among high school principals. Moreover, the research aims to understand the correlation between the various aspects of the organizational climate and its overall level, as well as the different aspects of total quality management and its overall level, among high school principals in Baghdad. This will be examined from the viewpoint of teachers. The researchers utilized a descriptive methodology to study a sample of (1080) secondary school teachers in six educational directorates within the Baghdad province throughout the academic year 2023-2024. Two scales were employed: one to assess organizational climate and the other to evaluate total quality management. The data was analyzed utilizing IBM SPSS Statistics Ver26 software, leading to a series of results and recommendations.

Keywords: Organizational Climate, Total Quality Management.

Introduction

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The current period is characterized by a growing accumulation of knowledge, scientific progress, and intense scientific competition between nations. This battle also encompasses global scientific leadership. The educational institution, represented by the Ministry of Education, has been pushed to reassess its educational systems in order to cultivate and equip future generations with the necessary skills to adapt to these changes and advancements. In order for a society to attain a distinguished status among others, it is crucial to recognize that this may be accomplished by providing a well-rounded education to future generations, utilizing sophisticated educational systems that are in line with the demands of the current era. The concept of organizational climate has garnered considerable attention from researchers owing to its significance in school administration and all educational endeavours. Consequently, enhancing it is seen as a fundamental duty of school principals, as they carry direct accountability for overseeing the school and its entirety of operations. Enhancing the organizational climate in secondary schools fosters the growth of employee performance and offers them an optimal working atmosphere to efficiently carry out the tasks given to them. It is crucial to differentiate between the term "quality," which pertains to specific requirements, and the term "total quality management," which incorporates all the actions undertaken by school principals to oversee school operations. Total quality management is a prominent methodology that empowers school principals to effectively oversee administrative tasks and strives to fulfil the needs and expectations of teachers, students, employees, and the wider community.

The research aims to illuminate the importance of organizational climate and total quality management for secondary school principals in Baghdad province, as perceived by secondary school teachers. The research seeks to comprehend the nature of the connection between the evaluators of secondary school principals in Baghdad province, as viewed by the teachers. The research challenge arises from the practical aspects of the educational and pedagogical process, specifically the roles of school principals and instructors. It necessitates the establishment of an appropriate organizational environment among them. The overall climate inside a school significantly influences the successful execution and implementation of all instructions necessary to meet the objectives set by the administration. It is the responsibility of the administration to establish a suitable ambiance or organizational climate within the school. Effective implementation of total quality management has a significant impact on the success of schools. Modern management approaches focus on continuously improving and enhancing the performance of all staff in secondary schools.

After reviewing scientific sources, research, and previous studies in the field of contemporary management, specifically focusing on organizational climate and total quality management, it is evident that there is a lack of sufficient studies on these concepts in the context of secondary schools. There are shortcomings in specific areas of the organizational climate, such as the inadequate training and development of teachers in the school, as well as issues pertaining to the interpersonal interactions between secondary school principals and

instructors. In addition, the researchers are not aware of any study that investigates the correlation between organizational climate and total quality management as perceived by secondary school teachers. The researchers were motivated to study and analyze the concepts of organizational climate and overall quality management among secondary school principals in Baghdad province, specifically from the perspective of teachers, in order to comprehend their relationship. The objective of the research is to determine the dominant factors that contribute to the organizational climate in secondary schools in Baghdad province. These

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

factors include organizational structure, leadership, employee engagement, communication, nature of work, technology, human resources, and autonomy. The perspective of teachers will be taken into account during the analysis. The objective is to determine the components of total quality management (including education and quality values, enhancement of the educational process, developing recognition and rewards, school leadership, and decision-making) among secondary school principals in Baghdad province, as perceived by teachers.

Moreover, the study seeks to investigate the correlation between the various aspects of organizational climate and its overall level, as well as the different aspects of total quality management and its overall level, among secondary school principals in Baghdad province. This will be done from the viewpoint of teachers. The research was carried out between February 20, 2024, and April 8, 2024

Methodology

The researchers employed the descriptive method with a survey approach since it was well-suited for addressing the study challenge. The descriptive method offers a meticulous comprehension of the interconnection of society, trends, preferences, desires, and progress. The researcher is able to accurately represent the current living conditions and develop benchmarks for making forecasts in the future " (Mahgoub, 2000, p. 95).

Research Sample

The research sample comprises secondary school teachers in the governorate of Baghdad, specifically in six educational directorates: Al-Karkh 1st, Al-Karkh 2nd, Al-Karkh 3rd, Al-Rasafa 1st, Al-Rasafa 2nd, and Al-Rasafa 3rd, for the academic year 2023-2024. The research community comprises a total of (2094) teachers, who are assigned to (1413) government secondary schools serving boys, girls, and mixed-gender students. Excluding female instructors, their schools, and private schools, the research specifically focused on male teachers. The research sample comprises (1129) teachers, accounting for (53.915%) of the entire research population. A total of (39) teachers were eliminated from the study because they either refused to answer the measures or provided partial responses. Additionally, (10) teachers who participated in the pilot survey were also deleted. Hence, the ultimate research sample comprises (1080) instructors, who are evenly distributed throughout the six educational directorates in the governorate of Baghdad, as illustrated in Table 1.

Table 1. *Shows The Total Number Of Research Community And The Number Of Schools In The Directorates Of Education In Baghdad*

No	Education directorates	No. of schools				No of males and females teachers			Percentage
		Boys	Girls	Mixed	Total	Males	Females	Total	
1	Al-Karkh 1st	100	86	31	217	196	173	369	
2	Al-Karkh 2nd	149	138	56	343	250	197	447	
3	Al-Karkh 3rd	96	83	23	202	152	97	249	
4	Al-Rasafa 1st	106	99	4	209	194	232	426	
5	Al-Rasafa 2nd	169	125	7	301	187	191	378	
6	Al-Rasafa 3rd	74	67	/	141	150	75	225	
	Total	694	598	121	1413	1129	965	2094	53.913%

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Means of Data Collection

The researchers employed various tools for their study, including Arabic and foreign references, the International Information Network (Internet), tests and measurements, personal interviews, an organizational climate scale, a total quality management scale, IBM SPSS Statistics Ver26 software for statistical analysis, and a Canon personal calculator.

Process For Conducting the Research

The researchers employed two scales: the first, developed by (Abdel Sattar, 2014, p. 98) , measures organizational climate, while the second, produced by (Sharita, 2013, p. 67) evaluates total quality management. Both scales employed in this study have been standardized for the Iraqi context and have been previously utilized in other examinations, showing their good reliability and validity. The subsequent section provides a precise clarification of the scales:

Organizational Climate Scale

The organizational climate scale developed by (Magda Abdel llah 2014) was used. It is consisting of (64) items distributed across (7) main areas. Each area includes items with a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree), with (53) positive items rated on a scale of (5-1) and (11) negative items rated on a scale of (1-5). The areas are divided as follows: Organizational Structure, consisting of (9) items; Leadership, consisting of (12) items; Employee Participation, consisting of (6) items; Communication, consisting of (11) items; Nature of Work, consisting of (11) items; Technology, consisting of (6) items; and Human Resources and Work Independence, consisting of (9) items.

Total Quality Management Scale

A total quality management scale, developed by (Helena Mahmoud, 2013), was used and implemented. The scale consists of 31 items distributed across 4 areas. Each area includes items with a five-point Likert scale (very high, high, moderate, low, very low) for rating. The four areas of focus are as follows: education and quality values (8 items), enhancement of the educational process (8 items), development of appreciation and rewards (7 items), and school leadership and decision-making (8 items).

Survey Experiment

The researchers conducted a survey experiment on 10 high school teachers in Baghdad province for the academic year 2023-2024. These teachers were excluded from the main sample. The purpose of this experiment is to extract the scientific foundations of the two scales, namely validity, stability, and objectivity, as follows:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Validity Of the Two Scales

The scales were sent to experts and professionals in the areas of management, organization, evaluation, and measurement to evaluate the clarity and appropriateness of their items for the research sample. Upon analyzing the data, it became evident that all participants concurred on the accuracy of the measures, thus establishing face validity for the scales based on expert opinion.

Reliability Of the Two Scales

The reliability of the organizational climate scale was calculated using three methods: test-retest, split-half, and Cronbach's alpha coefficient. In the test-retest method, the Pearson correlation coefficient was used to measure the relationship between the scores of the two subjects. The calculated value was (0.863), with a significance level (Sig) of (0.000), which is smaller than the accepted significance level of (0.05).

Therefore, the scale is considered to have high reliability. In the split-half method, the scale items were divided into two groups: one group with odd-numbered items and another group with even-numbered items. The Pearson correlation coefficient between the scores of the two groups was (0.841). After correction using the Spearman-Brown equation, the reliability coefficient of the scale became (0.955), as the correlation coefficient represents the reliability coefficient of the half-test. In the Cronbach's alpha coefficient method, the value obtained was (0.880).

The Total Quality Management (TQM) scale was calculated using three methods: test-retest, split-half using the Guttman equation (Al-Qaisi, 2020, p. 251) , and Cronbach's alpha coefficient. In the test-retest method, the Pearson correlation coefficient was used to measure the relationship between the scores of the subjects, resulting in a computed value of (0.816). The significance level (Sig) was found to be (0.000), which is smaller than the accepted significance level of (0.05), indicating high reliability of the scale. In the split-half method using the Guttman equation, with a total of (31) items, the correlation coefficient was (0.844). After correction using the Spearman-Brown formula, the reliability coefficient of the scale became (0.956), as the correlation coefficient represents the reliability of the half-test. In Cronbach's alpha method, the value obtained was (0.865).

Objectivity Of the Two Scales

The value of the Pearson correlation coefficient between the scores of the first and second results for the total score of the two scales was calculated. It was found that they both exhibit objectivity, as indicated by their respective computed values of (0.908) and (0.903). The significance level (Sig) for these values was found to be (0.000), which is smaller than the adopted significance level of (0.05).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Main Experiment

The researchers conducted the main experiment on February 28, 2024, involving (1080) teachers in secondary schools in Baghdad province, distributed among the six directorates for the academic year 2023-2024. They distributed survey questionnaires on organizational climate and total quality management through various methods, including school administration, supervisors, personal and official emails of teachers, and social media platforms such as WhatsApp, Viber, and Telegram. The importance of each scale was explained for the purpose of scientific research, emphasizing the need for careful and accurate responses without leaving any item unanswered or neglected. After collecting the data, it was statistically processed to obtain the final results.

Statistical Analysis

The data was processed using the pre-existing software (IBM SPSS Statistics Ver26) to calculate the following: arithmetic mean, standard deviation, median, skewness coefficient using the third moment method, Pearson's simple correlation coefficient, Spearman-Brown correlation coefficient, Cronbach's alpha coefficient, and Guttman's equation.

Result

Table 2. *The Arithmetic Means, Standard Deviations, Medians, And Skewness Coefficients For The Organizational Climate Scale*

No	First: Organizational structure	Arithmetic mean	Standard deviation	Median	Skewness coefficient
1	The unclear organizational structure of all school members	4.069	1.098	4.000	1.096
2	The school's structure is distinguished by its good design	3.960	1.218	4.000	0.864-
3	The school's organizational structure is characterized by rigidity	4.062	1.089	4.000	0.980
4	There is overlap and duplication in the tasks and roles.	3.957	1.238	4.000	0.948-
5	Specialized tasks help schools achieve their goals.	4.111	0.997	4.000	0.803
6	The school's organizational structure does not suit its nature and needs.	3.895	1.350	4.000	1.063-
7	The school's teachers' specializations match their occupations.	4.097	1.024	4.000	0.838

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

8	The departments of the organizational structure show a significant level of cooperation.	4.000	1.197	4.000	1.069
9	The school's organizational structure ensures fast, high-quality work.	4.027	1.124	4.000	0.912
	Second: Leadership				
10	The school's leadership improves performance and development.	3.997	1.197	4.000	1.046-
11	The school's principle has a clear vision and high decision-making skills.	3.960	1.251	4.000	1.051-
12	Teachers are encouraged to embrace change, creativity, and innovation by the school administration.	3.953	1.247	4.000	0.933-
13	The administration provides me with vital assistance to carry out my tasks and fulfil my obligations.	4.093	1.004	4.000	0.737
14	The relationship between the school administration and teachers relies on trust and collaboration.	4.169	0.890	4.000	0.614
15	The principal encourages his assistants to speak out and make suggestions.	4.042	1.135	4.000	1.083
16	The school administration encourages me to have self-reliance in addressing work-related challenges.	4.117	0.991	4.000	0.815
17	The principal disregards the needs of teachers.	4.114	0.991	4.000	0.802
18	The school administration interacts with teachers fairly and equally.	4.175	0.886	4.000	0.629
19	The administration of the school fails to make prompt choices.	4.043	1.135	4.000	1.086
20	The school principal retreats from decisions that fail to accomplish its objectives.	4.069	1.096	4.000	1.096

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

21	The school administration looks at the choices before making decisions.	3.976	1.212	4.000	0.908-
	Third: Employees' engagement				
22	Teachers actively engage in setting goals and making decisions that are directly related to their work units.	4.070	1.085	4.000	1.007
23	The school administration consults with teachers and considers their observations and feedback.	3.970	1.234	4.000	0.984
24	Teachers can make important decisions and take responsibility.	4.116	0.993	4.000	0.820
25	Collaboratively solve problems encountered by the organization units.	3.922	1.342	4.000	1.135-
26	The level of collaboration among teachers is inadequate.	4.063	1.101	4.000	1.075
27	Teachers contribute to developing performance evaluation criteria that fit their positions.	3.956	1.235	4.000	0.901-
	Fourth: Communication				
28	The school's communication system contributes to achieving its goals.	4.050	1.112	4.000	1.018
29	The school's system of communication facilitates the prompt dissemination of information.	3.950	1.256	4.000	0.971-
30	The school utilizes many communication channels in all directions.	4.103	1.008	4.000	0.807
31	The administration fails to address the barriers that hinder effective communication.	3.902	1.363	4.000	1.106-
32	The communication between the school principal and teachers is facilitated through a contemporary and advanced mechanism.	3.939	1.269	4.000	0.962-

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

33	The school principal selects clear and precise expressions when communicating with the teachers.	4.096	1.016	4.000	0.799
34	Communication between the school principal and the higher authorities is carried out without hindrance.	3.891	1.374	4.000	1.090-
35	Communication between the principal and other school principals is challenging.	4.059	1.103	4.000	1.062
36	The school communication system contributes to providing the necessary information for decision-making.	3.932	1.263	4.000	0.902-
37	Effective communication among teachers enhances interpersonal relationships among them.	4.026	1.151	4.000	1.042
38	The school administration utilizes oral communication to contact teachers in emergency situations.	3.926	1.289	4.000	0.963-
	Fifth: Communication				
39	Teachers' adherence to the designated working hours from the start of the workday until the end.	4.089	1.026	4.000	0.804
40	The arenas and playgrounds provide psychological and physical comfort for students (ventilation, lighting, movement).	3.878	1.392	4.000	1.077-
41	The administration provides students with security and safety.	3.939	1.276	4.000	0.978-
42	My employment duties are overwhelmed by my routines.	4.099	1.017	4.000	0.819
43	My work provides numerous opportunities for creativity and innovation.	3.891	1.380	4.000	1.099-

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

44	The amount of work aligns with my personal abilities and academic qualifications.	4.069	1.098	4.000	1.096
45	There are strict restrictions on my duties.	3.975	1.212	4.000	0.908-
46	Teachers experience discomfort when it comes to assigning assignments.	4.070	1.085	4.000	1.007
47	My job gets me the respect and esteem of fellow community members.	3.970	1.234	4.000	0.984-
48	Teachers in the school are entitled to the vacations they deserve according to the work system.	4.116	0.993	4.000	0.820
49	My job provides me with stability and job security.	3.922	1.342	4.000	1.135-
	Sixth: Technology				
50	The technology used in schools contributes to improving the performance level of teachers.	4.097	1.024	4.000	0.838
51	The school is committed to keeping up with technological advancements.	4.011	1.192	4.000	1.103
52	The technology used in schools leads to increased efficiency and reduced effort.	4.048	1.115	4.000	0.975
53	The technology used in the school is characterized by its ease of use and its compatibility with work requirements.	4.008	1.192	4.000	1.080
54	The school carries out most of its tasks using technology.	3.988	1.176	4.000	0.803-
55	The technology used contributes to the provision of information and data, as well as facilitating their accessibility.	3.942	1.172	4.000	0.722-
	Seventh: Human resources, and autonomy				
56	The school principal greatly values competent teachers in their work.	3.925	1.170	4.000	0.693-

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

57	The school principal is keen on attracting more competent teachers to enhance the academic level.	3.926	1.170	4.000	0.694-
58	The school principal aims to enhance the performance level of the teachers by involving them in training and development courses.	3.943	1.171	4.000	0.725-
59	The aim of specialized courses in which teachers participate outside of school is to enhance their cognitive abilities.	3.945	1.173	4.000	0.730-
60	Teachers lack the opportunity to pursue further education while working.	3.927	1.171	4.000	0.695-
61	The school administration grants teachers the autonomy to monitor students.	3.941	1.172	4.000	0.720-
62	The school administration grants teachers the freedom to participate in curriculum evaluation.	3.937	1.169	4.000	0.717-
63	The school administration provides the opportunity for students to participate in sports activities with other schools.	3.938	1.167	4.000	0.724-
64	The administration works to monitor and assess teachers in order to identify their strengths and weaknesses.	4.069	1.098	4.000	1.096
	Total score	260.588	41.126	280.00	0.341-

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 3. *The arithmetic means, standard deviations, medians, and skewness coefficients for the organizational climate scale*

No	First: Areas and its items	Arithmetic mean	Standard deviation	Median	Skewness coefficient
	Education and quality values				
1	The manager carries the responsibility for managing the teachers, students, and administration in order to achieve advanced levels of performance.	4.046	1.089	4.000	1.075
2	The manager provides strategies to teachers to achieve excellence within the educational institution.	3.937	1.207	4.000	0.844-
3	The manager excels in distributing educational resources scientifically.	4.038	1.079	4.000	0.958
4	The manager carefully oversees role allocation and precisely defines responsibilities for the teachers.	3.934	1.228	4.000	0.929-
5	The manager prepares the teachers to accept the concepts and practices associated with the quality system.	4.088	0.987	4.000	0.772
6	The manager safeguards the students from failure before it occurs.	3.872	1.340	4.000	1.050-
7	The manager trains employees on problem-solving skills.	4.074	1.015	4.000	0.809
8	The manager provides the technical, scientific, and material programs to implement quality programs.	3.976	1.187	4.000	1.051-
	Enhancement of the educational process				
9	The manager encourages faculty members to innovate and enhance performance.	4.004	1.114	4.000	0.890
10	The manager creates a conducive environment for learners characterized by cooperation and camaraderie.	3.974	1.187	4.000	1.028-

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

11	The manager subjects educational goals to measurement processes.	3.937	1.240	4.000	1.035-
12	The director monitors the teachers' utilization of diverse teaching methods.	3.930	1.237	4.000	0.915-
13	The manager adheres to the principle of continuous improvement in the learning process.	4.070	0.995	4.000	0.706
14	The director organizes activities aimed at achieving the full development of the learner's personality.	4.146	0.881	4.000	0.574
15	The manager's ability to be familiar with individuals' knowledge of the core skills of total quality.	4.019	1.126	4.000	1.064
16	The manager encourages individuals to learn from their mistakes.	4.094	0.981	4.000	0.784
	Development of recognition and rewards				
17	The manager trains individuals to excel performance.	4.0917	0.982	4.000	0.771
18	The manager establishes a system for evaluating individual rewards.	4.151	0.877	4.000	0.588
19	The manager excels at placing the right person in the right position.	4.020	1.125	4.000	1.067
20	The manager deliberately adopts the principle of extra efforts to enhance the quality of rewards.	4.046	1.089	4.000	1.075
21	The manager maximizes the utilization of the particular type of remuneration based on the features of the work being performed.	3.952	1.201	4.000	0.888-
22	The manager considers the principle of efficiency when selecting someone to perform a specific educational task.	4.047	1.075	4.000	0.985

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

23	The manager works to establish a system of incentives for teachers and students to achieve the school's objectives.	3.947	1.223	4.000	0.966-
	School leadership and decision-making				
24	The manager actively engages with employees and members in the process of decision-making.	4.093	0.984	4.000	0.790
25	The manager provides individuals with the opportunity to participate in presenting their ideas.	3.899	1.332	4.000	1.121-
26	The manager cultivates strong relationships between employees and the outside world.	4.039	1.092	4.000	1.054
27	The manager delegates some responsibilities to the teachers to enhance the students' understanding of quality.	3.933	1.225	4.000	0.882-
28	The business manager distributes resources to teachers to enhance the quality outcomes of education.	4.027	1.103	4.000	0.997
29	The manager contributes to the carrying out of projects that are relevant to the employees.	3.927	1.246	4.000	0.953-
30	The manager facilitates individuals in expressing their ideas freely during the conducted meetings.	4.080	0.998	4.000	0.777
31	The manager is engaged in studying complaints and suggestions from the community regarding students.	3.879	1.352	4.000	1.093-
	Total score	**141.435**	**9.187**	**145.00**	**0.747-**

It is evident from tables (2, 3) that all values of the skewness coefficients of the organizational climate scale and its overall degree, as well as all dimensions of the total quality management scale and its overall degree, were less than (+3), indicating sample consistency.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Looking at and assessing the correlation between the various aspects of the organizational climate and its overall grade, and the different aspects of total quality management and its overall grade:

The researchers used Pearson's simple correlation coefficients to determine the relationship between the aspects of organizational climate and its total score and the aspects of total quality management and its total score for secondary school principals, from the perspective of teachers. They found a significant positive correlation between the organizational climate scale and its aspects (organizational structure, leadership, employee engagement, communication, work nature, technology, human resources, and work autonomy) and the total quality management scale and its aspects (education and quality values, enhancement of the educational process, development of recognition and rewards, school leadership, and decision-making). This was evidenced by all correlation coefficients having a significance level (Sig) smaller than the adopted significance level of (0.05), indicating a significant relationship at a degree of freedom (1078), as shown in Table (4).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 4. *illustrates the correlation coefficients between the aspects of organizational climate and the aspects of total quality management*

Scale	Aspects	Total Quality Management: Education and quality values	Sig	Enhancement of educational process	Sig	dev. of appreciation and rewards	Sig	School leadership & decision-making	Sig	Total grade	Sig
Organizational climate	Organizational Structure	0.763	0.000	0.641	0.000	0.732	0.000	0.711	0.000	0.770	0.000
	Leadership	0.812	0.000	0.811	0.000	0.794	0.000	0.810	0.000	0.802	0.000
	Employees engagement	0.731	0.001	0.668	0.000	0.679	0.001	0.690	0.020	0.701	0.001
	Communication	0.658	0.001	0.710	0.000	0.685	0.000	0.677	0.000	0.688	0.000
	Nature of work	0.593	0.010	0.598	0.000	0.670	0.002	0.836	0.002	0.599	0.000
	Technology	0.722	0.000	0.735	0.000	0.781	0.000	0.711	0.000	0.766	0.000
	Human resources and autonomy	0.801	0.000	0.745	0.001	0.787	0.000	0.769	0.000	0.804	0.000
	Total score	0.867	0.000	0.822	0.000	0.816	0.000	0.802	0.000	0.831	0.000

Discussing

The researchers found a notable correlation between the aspects of organizational climate and its overall score, as well as the total quality management aspects, among secondary school principals in Baghdad, as perceived by teachers. The logical outcome can be attributed to the confluence of instructors' viewpoints on the prevailing climate inside their respective schools, as they operate in a shared setting yet with varying age groups. Furthermore, both the employees and the school's management, led by the principal, share an equal degree of satisfaction with the current work environment, as it is governed by the principles of total quality management. This has led to the presence of a conducive organizational climate for effectively completing any assigned work and carrying out educational responsibilities in a positive manner, in addition to the overall atmosphere and prevalent organizational climate. The researchers' findings corroborate the assertions made by (Farida Mohammed 2019), which state that "organizational climate encompasses the internal work environment together with its diverse elements, characteristics, and interactions. This sets it apart from other institutions by virtue of its unique organizational

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

climate, which encompasses aspects such as organizational structure, communication systems, work systems and procedures, leadership style, decision-making style, and the nature and conditions of work. Additionally, the external work environment and work group also contribute to this distinction. These elements collectively establish the fundamental structure within which institutions function and are influenced by various factors such as social, cultural, economic, political, technical, and legal forces." (Al -Andalusi, 2019, p. 1) .The findings also corroborate the research conducted by (Farouk Abdo and Sayed Mohamed 2014) as it verifies that "the organizational structure is one of the most crucial elements of the organizational climate. It is essential for the structure to be in line with the organization's scope and specialization, and to meet its requirements for functions and expertise. Furthermore, the structure must possess the ability to fulfil the organization's operational needs, streamline processes, guarantee seamless transmission of decisions, orders, and directives, and promote the sharing of suggestions and ideas across various departments. Hence, attaining the objectives of the organizational structure emphasizes its importance as a beneficial factor in the organizational climate." (Fleih & Abdel Mageed, 2014, p. 82) .

The study result meets with (Abdullah Taha's, 2001) study which establishes that "the organizational structure is a key element of the dominant organizational climate inside an institution. It functions as the intermediary that establishes connections between different parts of the institution, including personnel, tasks, responsibilities, information systems, and decision-making procedures." (Al -Safi, 2001, p. 39). It also meets with (Farouk Abdo and Mohamed Abdel Mageed, 2009) study emphasizing that "organizational climate plays a crucial role in aligning the aims of the institution with the ambitions of its people.

Furthermore, it aids in the advancement of the institution by focusing on improving its many facets. Moreover, the organizational climate plays a crucial role in fostering the development of employees' ability in effectively resolving their difficulties." (Fleih & Abdel Mageed, 2009, p. 294) . The results also corroborate with (Anastasi's study, 1982) finding that "the effectiveness of total quality management is significantly affected by the management's dedication and understanding of the importance of appropriate leadership. The management only assumes complete accountability for the preparation and execution of total quality management.The process of selecting leaders for total quality management should be guided by specific criteria related to the defined leadership attributes outlined below. The responsibility for overseeing the quality implementation process should be given to a person who possesses a comprehensive understanding of quality and acknowledges that it includes all activities and tasks. The ideal leader should exhibit a dynamic personality and have a well-defined vision for enhancing the quality improvement process. A leader cannot effectively cultivate a sense of quality in employees without demonstrating perseverance and attention to attaining the proper things from the start." (Anastasi, 1982, p. 24) . The study results are consistent with the assertions made by (Ali Ahmed and Hisham Musa, 2006) which states that "the school, as the administrative entity at the most basic level of the educational system hierarchy, bears the duty for making educational decisions. The principal is accountable for making determinations concerning student progress and education, teaching methodologies, enhancement and creation of the curriculum, faculty and staff matters, the school's connection with the surrounding community, financial resources, infrastructure, and school amenities." (Ayasrah & Hijazin, 2006, p. 51) . (Mohammed Awad and Ghadeer Arafat, 2009) also affirms that "the absence of staff engagement in the Total Quality Management program is a barrier to the successful implementation of comprehensive quality standards. In order to achieve

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

success in this program, it is essential to engage all members of the institution and ensure their unwavering dedication and accountability towards it." (Al Tarbawy & Juwaihan, 2009, p. 49).

Conclusions

1.There is a beneficial relationship between various aspects of the organizational climate (such as organizational structure, leadership, employee engagement, communication, nature of work, technology, human resources, and autonomy) and various aspects of total quality management (including education and quality values, enhancement of educational processes, development of recognition and rewards, school leadership, and decision-making) that exist in secondary schools in Baghdad, as perceived by teachers.

2.There is a positive correlation between the total score of organizational climate and the total score of total quality management among secondary school principals in Baghdad province, as perceived by teachers.

Recommendations

1.The selection of a school principal should be based on specific criteria, guidelines, and qualifications to establish an appropriate organizational climate.

2. Promoting a culture of total quality management for the school principal is crucial. This will have a beneficial impact on the work and performance of teachers, leading to improved morale and a better organizational climate in schools.

3. Carry out more research to examine the perspectives of male and female teachers about the organizational climate and total quality management.

4. It is essential to offer financial incentives to school principals that actively strive to enhance the organizational climate within their schools, alongside integrating total quality management into the assessment of personnel performance.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Administrative Transparency of Middle and Preparatory School Principals in the Karbala Governorate Education Directorate from the Perspective of Physical Education Teachers

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Abstract

The research aims to identify the administrative transparency of school principals from the perspective of physical education teachers in Karbala Governorate. The experiment was conducted to apply the scale to a sample of (408) physical education teachers in middle, preparatory, and secondary schools for boys. The researchers used the descriptive approach with a survey method to suit the nature of the problem to be solved. The statistical package (SPSS) was used to extract the results of the arithmetic mean (Mean), standard deviation (Std-Deviation), and the statistical (t) test for two independent samples. The Spearman-Brown equation and the simple correlation coefficient (Pearson) were used. The result was the construction of a scale of administrative transparency among school principals in Karbala Governorate. The process of constructing the research scale is of great importance in revealing the administrative transparency of school principals, the motivation of physical education teachers, and the extent of their administrative interaction in managing the school and teaching sports in a proficient manner. The researchers recommend the necessity of formulating a future vision for the school based on administrative transparency practices to explore good opportunities and the reasons for the decline in students' academic, athletic and psychological levels, which would enable it to support teachers' motivation. The school administration must rely on the dimensions of administrative transparency (information, participation, accountability, work systems and procedures, communication, performance evaluation), to work on enhancing the school's reputation, to contribute to shaping its future, conducting assessments of the risks surrounding it and monitoring the changes that affect its activities

Keywords: Administrative Transparency, Middle and Preparatory School Principals, Karbala Education Directorate, Physical Education Teachers.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Introduction

Today, sport has become an essential part of many people's lives, characterized by excitement and enjoyment in its practice in one form or another, particularly for physical education teachers. This has strengthened its connection to practical life through various programs aimed at developing and improving sport within society in general. Beyond being a hobby, sport has become closely linked to the educational sector, contributing to the formation of generations physically, health-wise, psychologically, and motorically. Consequently, it has gained significant attention from countries seeking to sustain the educational community by investing in school sports as an effective outlet for developing abilities, ideas, and sports programs.

This places a responsibility on school administrations to provide appropriate conditions that allow the implementation of sports work requirements through specific time schedules, structured lessons, and continuous participation by specialists—namely physical education teachers in intermediate and secondary schools—who serve as the main link in shaping these conditions and available resources. Administrative transparency is considered one of the modern management approaches and a key factor in sustaining administrative work within educational institutions in the context of the ongoing information revolution. This is reflected in school management practices and how their requirements are implemented in relation to school sports and physical education teachers in particular. As an administrative concept, transparency enables cooperation and the provision of the best possible practices, striving for clarity in management and openness toward developing the sports field while enhancing the principle of quality performance at work.

Administrative transparency holds great importance in this educational context, particularly in its influence on providing material and moral support services to physical education teachers and strengthening their motivation. School administration represents the central axis in managing work, organizing and coordinating duties and tasks, and promoting a culture of administrative transparency based on information and data related to sports programs. It also involves shaping internal and external factors and maintaining open communication to foster cooperation among principals, teachers, and students, as well as implementing policies and procedures that ensure integrity and transparency in dealing with everyone. Furthermore, efforts must be made to address the problems facing school administrations, as routine practices, delays, and reliance on traditional administrative methods have necessitated the adoption of administrative transparency as a distinguishing approach that encourages principals to adopt responsive methods and motivates teachers to accept and implement work plans. Increasing the level of transparency contributes to strengthening trust among stakeholders and reinforces acceptance of higher administration. Therefore, administrative transparency has become a vital issue in the educational

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

community, centering on teachers' rights, the clarification of duties, and commitment to professional and ethical responsibilities toward all.

From this standpoint, the importance of the study lies in understanding the relationship and the strength of functional association in applying administrative transparency by school principals to enhance motivation among physical education teachers and reflect their professional behaviors toward work tasks. It also seeks to explore how school administration can improve its performance and effectiveness in achieving its goals through the application of administrative transparency principles in its daily activities, as an important aspect in building a positive work environment and ensuring collective participation in the success of school work in general and sport in particular.

Methodology

The researchers used the descriptive approach with a survey method due to its suitability for the nature of the problem to be addressed. The research population consisted of physical education teachers in intermediate, preparatory, and secondary schools for boys in Karbala Governorate, totaling 171 schools and 438 teachers, according to the official facilitation letter (Appendix 1). A percentage of 50.22% of the total population was adopted, representing 220 teachers, as shown in Tables (1, 2, and 3).

The pilot sample consisted of 30 teachers selected randomly from the original population but outside the construction and application samples. The pilot study was conducted on Monday (10/2/2025). The scale construction sample consisted of 100 physical education teachers from intermediate, preparatory, and secondary schools for boys in Karbala Governorate, selected randomly from the original population. The application sample of the scale was also selected randomly and included 90 teachers from the research population.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 1. Number of schools in Karbala Governorate, its districts, and subdistricts

Area	Intermediate Schools	Secondary Schools	Preparatory Schools
Governorate Center	47	5	21
Al-Husseiniya District	13	3	5
Al-Hurr District	13	5	5
Al-Hindiya District	31	12	7
Ain Al-Tamr District	2	1	1
Total	**106**	**26**	**39**

Table 2. Number of physical education teachers in each area

Area	Number of Teachers
Governorate Center	172
Al-Husseiniya District	79
Al-Hurr District	50
Al-Hindiya District	133
Ain Al-Tamr District	4
Total	**438**

Table 3. Distribution of the research population and samples

Area	No. of Teachers	Excluded	Remaining	Pilot Sample	Construction Sample	Application Sample
Governorate Center	172	67	105	15	50	40
Al-Husseiniya District	79	49	30	5	10	15
Al-Hurr District	50	17	33	5	20	8
Al-Hindiya District	133	85	48	3	20	25
Ain Al-Tamr District	4	–	–	2	–	2
Total	**438**			**30**	**100**	**90**

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Determining the Idea and Objective of the Scale

This represents the first step in constructing and designing the scale and is of great importance, as it is linked to defining the research topic in terms of its concept and the aspects required for investigation. By reviewing previous studies and available information, the researchers clearly defined the idea of the scale to represent the phenomenon under study, namely constructing a scale of administrative transparency among school principals as perceived by physical education teachers. After defining the scale's concept, its objective was determined as adopting a scientific tool to identify the reality of administrative transparency among school principals and its relationship with physical education teachers (Ahmed, 2006).

Determining the Domains of the Scale

After reviewing the research procedures, consulting experts' opinions, and examining the theoretical framework, the main dimensions of the research variable were adopted. Seven domains were initially proposed for the administrative transparency scale. These domains were presented to 25 experts and specialists in sports administration and teaching methods, in addition to faculty members from colleges of physical education and sports sciences. Based on the chi-square (χ^2) value at a significance level of (0.05), two domains were excluded and five domains were retained.

Table 4. Domains of the administrative transparency scale

No.	Scale	Domains
1		Administrative Communication
2		Participation in Work
3		Promotion of Justice
4	Administrative Transparency	Financial Transparency
5		Trust Enhancement
6		Integrity at Work
7		Organizational Follow-up

Preparation of Scale Items

After defining the domains, a questionnaire was prepared that included the proposed domains and their items. The questionnaire contained a set of statements distributed across the approved domains according to their operational definitions. The initial version of the administrative transparency scale consisted of 45 items.

A five-point Likert scale was used according to Anastasi (1979): (Strongly Agree, Agree, Sometimes, Disagree, Strongly Disagree).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Scores were assigned as follows:
5 = Strongly Agree
4 = Agree
3 = Sometimes
2 = Disagree
1 = Strongly Disagree

This was adopted in a positive direction (Al-Khaikani & Al-Jubouri, 2016).

Procedures for Constructing the Administrative Transparency Scale

The researchers reviewed scientific literature related to measuring administrative transparency and relied on previous studies, including Al-Momani (2019). The initial questionnaire consisted of seven domains. Experts evaluated their suitability, and five domains were approved:

- Administrative communication
- Participation in work
- Financial transparency
- Promotion of justice
- Integrity at work

Another questionnaire was then developed based on previous studies, including Al-Mutairi (2016), consisting of 45 items distributed across the five domains as follows:

- Administrative communication: 10 items
- Participation in work: 10 items
- Financial transparency: 7 items
- Promotion of justice: 8 items
- Integrity at work: 10 items

Validity of the Administrative Transparency Scale Domains

Table 5. Chi-square (χ^2) analysis of expert agreement on the domains

Domains	Experts Agree	%	Experts Disagree	%	Calculated χ^2	Statistical Significance
Administrative Communication	24	96	1	4	21.16	Significant
Participation in Work	20	80	5	20	9.00	Significant
Promotion of Justice	18	72	7	28	4.84	Significant
Financial Transparency	21	84	4	16	11.56	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Trust Enhancement	17	68	8	32	3.24	Not significant
Integrity at Work	22	88	3	12	14.44	Significant
Organizational Follow-up	13	52	12	48	0.04	Not significant

Validity of the Administrative Transparency Scale Items

Table 6. Chi-square (χ^2) analysis of expert agreement on scale items

Domain	Item No.	Experts Agree	%	Experts Disagree	%	χ^2	Significance
Administrative Communication	1	25	100	0	0	25	Significant
	2	23	92	2	8	17.64	Significant
	3	19	76	6	24	6.76	Significant
	4	21	84	4	16	11.56	Significant
	5	18	72	7	28	4.84	Significant
	6	16	64	9	34	1.96	Not significant
	7	24	96	1	4	21.16	Significant
	8	19	76	6	24	6.76	Significant
	9	22	88	3	12	14.44	Significant
	10	20	80	5	20	9.00	Significant
Participation in Work	1	25	100	0	0	25	Significant
	2	19	76	6	24	6.76	Significant
	3	21	84	4	16	11.56	Significant
	4	18	72	7	28	4.84	Significant
	5	19	76	6	24	6.76	Significant
	6	20	80	5	20	9.00	Significant
	7	25	100	0	0	25	Significant
	8	23	92	2	8	17.64	Significant
	9	20	80	5	20	9.00	Significant
	10	13	52	12	48	0.04	Not significant
Financial Transparency	1	23	92	2	8	17.64	Significant
	2	21	84	4	16	11.56	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

	3	20	80	5	20	9.00	Significant
	4	18	72	7	28	4.84	Significant
	5	23	92	2	8	17.64	Significant
	6	20	80	5	20	9.00	Significant
	7	21	84	4	16	11.56	Significant
	1	19	76	6	24	6.76	Significant
	2	25	100	0	0	25	Significant
	3	23	92	2	8	17.64	Significant
	4	19	76	6	24	6.76	Significant
Promotion of Justice	5	20	80	5	20	9.00	Significant
	6	18	72	7	28	4.84	Significant
	7	23	92	2	8	17.64	Significant
	8	19	76	6	24	6.76	Significant
	1	21	84	4	16	11.56	Significant
	2	23	92	2	8	17.64	Significant
	3	25	100	0	0	25	Significant
	4	19	76	6	24	6.76	Significant
	5	18	72	7	28	4.84	Significant
Integrity at Work	6	14	56	11	44	0.36	Not significant
	7	23	92	2	8	17.64	Significant
	8	19	76	6	24	6.76	Significant
	9	21	84	4	16	11.56	Significant
	10	13	52	12	48	0.04	Not significant

To achieve this, the researchers adopted the extreme groups method to calculate the discriminatory power of the items using the Statistical Package for the Social Sciences (SPSS). The questionnaires were arranged in ascending order from the lowest score to the highest score. Then, 27% of the questionnaires with the highest scores and 27% of those with the lowest scores were selected. The sample size reached 438 teachers. The t-test (T-test) was applied to each of the 45 items of the administrative transparency scale. After analyzing the results, no item was eliminated from the administrative transparency scale because the level of significance was greater than (0.05). Accordingly, the administrative transparency scale consisted of 41 items.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Description of the scale in its final form

Table 7. Shows the administrative transparency scale in its final form consisting of 41 items

Sequence	Domain	Number of Items	Items
1	Administrative Communication	9	(1, 2, 3, 4, 5, 6, 7, 8, 9)
2	Participation in Work	9	(10, 11, 12, 13, 14, 15, 16, 17, 18)
3	Financial Transparency	7	(19, 20, 21, 22, 23, 24, 25)
4	Promotion of Justice	8	(26, 27, 28, 29, 30, 31, 32, 33)
5	Integrity at Work	8	(34, 35, 36, 37, 38, 39, 40, 41)

Methods of Data and Information Collection

Arabic and foreign sources, personal interviews, field visits, the World Wide Web (Internet), information collection forms, data tabulation forms, and questionnaire forms to survey experts' opinions.

Statistical Methods

The statistical data were processed using SPSS, and the following were extracted: Chi-square test (χ^2), arithmetic mean, median, standard deviation, t-test formula for two equal independent samples, independent samples t-test, paired samples t-test, standard deviation, Spearman–Brown equation, Cronbach's alpha coefficient, simple correlation coefficient (Pearson), coefficient of skewness, significance of the correlation coefficient, and the hypothetical mean.

Results

Table 8. Statistical indicators of the Administrative Transparency Scale and comparison between the actual mean and the hypothetical mean

Scale	Number of Items	Hypothetical Mean	Arithmetic Mean	Standard Deviation	Mean Difference	Calculated T-value	Significance Level	Type of Significance
Administrative Transparency	41	123.000	157.0556	9.18763	34.05556	35.165	0.000	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 9. Statistical indicators of the domains of the Administrative Transparency Scale and comparison between the arithmetic mean and the hypothetical mean

Domain	Number of Items	Hypothetical Mean	Arithmetic Mean	Standard Deviation	Mean Difference	Calculated T-value	Significance Level	Type of Significance
Administrative Communication	9	27.000	35.5111	3.00653	8.51111	26.856	0.000	Significant
Participation in Work	9	27.000	35.6111	2.85096	8.61111	28.654	0.000	Significant
Promotion of Justice	7	21.000	23.0000	1.69600	2.00000	11.187	0.000	Significant
Financial Transparency	8	24.000	31.1889	3.05711	7.18889	22.309	0.000	Significant
Integrity at Work	8	24.000	31.7444	2.82668	7.74444	25.992	0.000	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Discussion

The results indicated that the arithmetic mean of teachers' scores on the Administrative Transparency Scale (157.0556) was higher than the hypothetical mean (123.000), with a statistically significant t-value (35.165) at a significance level of (0.000), which is lower than (0.05). This demonstrates the presence of statistically significant differences in favor of the arithmetic mean. This finding reflects that school principals possess a high level of administrative transparency in managing their schools.

The researchers attribute this result to the tendency of school principals to achieve professional self-realization within their schools and social environment. Many studies, such as Ismail (2006), explain that individuals seek social status, appreciation, and recognition by demonstrating competence, achieving ambitions, and satisfying personal and professional needs through transparency and the ability to cope with life pressures. This indicates that school principals exhibit a notable level of administrative transparency.

With respect to the first category, administrative communication, statistically significant differences in favor of the arithmetic mean were obtained. This may be because the school principal and teachers keep communication with each other through official working channels as well as social media sites, Internet groups. In this way teachers understand ministerial instruction and administrative decision. This is especially significant for physical education teachers, whose role is extremely varied: from managing inside school activities, organizing sports teams and scout groups, running the school celebration of ceremonies (with flags) to preparing the participation form for any sport competition. Administrative Task Administrative work is a unifying factor for school management and physical education teachers and becomes stronger over time by acquiring experience and practice. El-Wahed (2013) specified that managerial skills can be seen in the ability of an educational leader to know job mandates and create compatibility between organizational objectives and the requirements of students on pragmatic grounds.

As for the second domain, work engagement, the authors explain that this result is attributed to successful school leadership being based on working in collaboration with teachers from various specialist areas. This includes organizing development programs, brainstorming and examining the school system\'s needs to pursue excellence in a theoretical manner as well as practical. Physical Education classes need the support of the school administration especially when it involves forming committees for school events, celebrations and competition. Al-Anzi (2019) also argued that cooperation and involvement contribute to institutional success, as teachers-academic managers' synergy facilitates the optimization of resources and an efficient pursuit of goals.

With respect to the third domain, social justice advocacy, findings underscore the significance of inclusivity and equity within the school. The success of the organization is based on an amalgamation and cooperation performance between school administration, teaching staff and educational directorate as well as parents. The pursuit of justice is a moral buttress and an engine of change. The unique and diverse duties of physical

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

education classes necessitate such support because PE courses play different roles as a mechanism for relaxation, game-developer, and behaviour modifier among students. Al-Otaibi (2018) reported that justice is under-pinned by the mechanism of systematizing processes, which are designed to secure equality, fairness, and objectivity in the administration of affairs.

With respect to the fourth sphere, financial transparency, it has been revealed that school principals are transparent when handling finances allocated to the schools. These resources may be school budgets, school shop incomes, donations from parents, charity groups and also teachers. According to Abu Karim (2005), good governance practices which is characterized by clear and transparent procedure, culture of shared communication and openness fosters value of integrity at the same time reduce corruption that effects teacher's performance and school trust.

Last, in the fifth category working integrity (d=60), a significant difference was found in favor for mean. It indicates that school principals may hold the professional and ethical beliefs to manage schools in an efficient way by making fair use of regulations, avoiding the favoritism through annual evaluations, and compensation for strengths and weaknesses from teachers. They also honor master teachers with recognition and appreciation. Physical educators, as a result, are on the front line and receive significant focus as they may represent gatekeepers in school life. Shahda (2022) also argued that Workplace justice could also be reflected through a transparent provision of an administration, the decisions taken in promotion and instruction as well as other characteristics in the institution.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Conclusions

1. A scale of administrative transparency for principals at 3101 schools in Karbala Governorate proved good.
2. The development of the research scale is important to determine the level of administrative transparency in terms of school principals, physical education teachers' motivation and their administrative interaction relations as an effective management system for school activities, as well as for sports classes.
3. According to the feedback from our research sample, lack of transparency results in low job attachment and organization commitment.
4. PE teachers are more vigilant to administrative fairness in their work (activity, external and less formal feedback procedures) meaning that if administrative bias is evident, it may be easier to detect.

Recommendations

1. To develop an ideal school plan in the aspect of administrative transparency, to determine what constitutes opportunity and cause for students' academic failure and other psychological elements, so as to increase teachers' motivation.
2. Administrative transparency dimensions may be adopted by school administrations that are looking to build the reputation of their schools, participate in shaping its future direction, as well as conducting an audit of risks and monitoring for change which affects it.
3. The necessity of holding seminars, training courses and workshops to improve the level communication between school headed by principals and teachers, participation in decision-making process, future plans of schools.
4. School authorities and administrators should encourage the provision of fields, equipment, and resources for sports since they are significantly affecting in positively inspiring teachers to impart their skills and experiences on students.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The effect of active learning on improving the performance of some floor movement skills in gymnastics for fifth-grade female students

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Abstract

The research aims to identify the effect of active learning in improving the performance of female students in the class Fifth grade primary for some skills of the floor movements apparatus in gymnastics The research problem included the following question: What is the effect of using active learning in improving performance? Fifth grade students demonstrate some balance beam skills in gymnastics. Using the experimental method by designing the experimental and control groups, representing the community Research on the students of Al-Yaqeen Elementary School in Al-Qadisiyah Governorate for the academic year 20242025 The sample consisted of 40 female students who were divided into two groups, each group(20) female The study was applied in the main section only of the educational units of (30) minutes, where the educational units were prepared Its number is (8) units, which took a period of 4 weeks. which students and the homogeneity and equivalence of the research variables were checked, and the most important results were that Active learning teaching has a positive impact on learning and developing the level of skill performance in Gymnastics skills of the sample. The researcher recommended using active learning as one of the Modern methods of learning gymnastics skills .

Keywords: Active learning, fifth grade, ground movements, Gymnastics.

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Journal of Physical Education
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https://jcope.uobaghdad.edu.iq

Introduction

In light of the rapid developments the world is witnessing across various fields, traditional teaching methods have become ineffective in achieving the desired educational objectives, particularly in areas that require active interaction and participation from learners. In this context, the importance of active learning has emerged as one of the modern instructional approaches that focuses on activating the learner's role and making them an essential partner in the learning process rather than a passive recipient. Active learning includes a wide range of strategies suitable for different educational situations and applicable across multiple educational stages due to their flexibility, attractiveness, and ability to achieve educational goals. These strategies emphasize learner activity and positivity, such as brainstorming, think–pair–share, dialogue and discussion, discovery, problem solving, cooperative learning, role-playing, compare and contrast, and academic games (Ramadan, 2010).

Through active learning, the learner's role shifts from passivity to positivity; instead of being a passive listener, the learner becomes an active participant who uses their thinking, intellect, and abilities collaboratively with peers to reach, process, and benefit from knowledge. Likewise, the teacher's role changes from a lecturer and transmitter of information to a guide and facilitator of the educational process (Haney, J., 2003).

Gymnastics is considered one of the sports that requires significant physical attributes and great effort to master and learn due to the multiplicity of its skills, the difficulty of its apparatuses, performance requirements, varying apparatus heights, and the need for control, precision in skill execution, and evaluation (Adel Saad, 1999). Based on the above, the researcher believes that primary school pupils represent the fundamental base upon which higher levels are built, through educating and preparing them in ways that suit the characteristics of their age stage and the features of each phase. This means that active learning transfers the pupil from being a recipient of knowledge to a researcher and participant in acquiring knowledge and learning skills. The skills of the floor exercise apparatus are among the important skills that require precision, balance, and self-confidence (Qabil Salem, 2020).

In light of modern educational trends, active learning has emerged as one of the effective methods that encourage learner interaction and positive participation, which may contribute to improving skill performance among pupils. As for the research problem, the researcher observed that some fifth-grade primary schoolgirls face difficulties in linking skills or movements on the floor exercise apparatus, which may be attributed to reliance on traditional teaching methods, leading to weak technical performance. Accordingly, the research problem was formulated in the following question: What is the effect of active learning on improving the performance of some floor exercise skills in gymnastics among fifth-grade pupils?

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The objectives of the research included identifying the effect of active learning on improving the performance of some floor exercise skills among fifth-grade pupils in gymnastics before and after the application of active learning. The researcher hypothesized that there would be statistically significant differences between the mean scores of pupils' skill performance in the pre- and post-tests when using active learning, in favor of the post-test.

A study by Ahmed Issam (2018) aimed to identify the effect of using active learning on aspects of learning certain skills in physical education for middle school students, using an experimental method with two groups: one control and one experimental. The most important results indicated that the active learning program using the think–pair–share strategy showed a positive effect on cognitive achievement and the level of handball skill performance.

Another study by Yousef, R. T. (2021) aimed to identify the effect of active learning using the small-group method on developing some motor abilities and learning the lay-up shooting skill in basketball for pupils. The researcher used an experimental method with two groups, one control and one experimental. The research sample consisted of 51 pupils, with each group comprising 15 pupils selected randomly. The most important results showed that the educational curriculum applied to the experimental group had a significant effect on developing motor abilities and improving skill performance levels among pupils.

Methodology

The researcher used the experimental method with an experimental design involving two groups, one control and one experimental, applying pre- and post-tests due to its suitability for the nature of the research.

The research population consisted of female pupils from Al-Yaqeen Primary School, numbering 200 pupils, in Al-Qadisiyah Governorate for the academic year 2024–2025. The research sample was composed of 40 fifth-grade female pupils, who were divided into 20 pupils in the control group and 20 pupils in the experimental group. The researcher conducted homogeneity and equivalence tests on the research sample for the variables (height, age, mass, and skills). The results indicated that the sample was homogeneous and normally distributed, as the skewness coefficient ranged between (±3), as shown in Table (1).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 1. *Shows the homogeneity and equivalence of the sample (N = 40)*

Variables	Unit of Measurement	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	Calculated *t*	Significance
Age	Year	130.5 ± 3.2	129.5 ± 2.7	0.44	Not significant
Height	cm	144.4 ± 4.6	143.7 ± 3.6	0.51	Not significant
Body mass	kg	38.1 ± 3.6	37.7 ± 3.3	0.30	Not significant
Cat jump	Score	4.5 ± 1.2	3.3 ± 1.00	0.25	Not significant
Scissor jump	Score	5.2 ± 1.5	4.0 ± 0.3	1.33	Not significant
Wolf jump	Score	4.3 ± 0.2	2.9 ± 0.5	1.35	Not significant

Table (1) shows that the calculated *t*-values are smaller than the tabulated *t*-value (1.69) at the significance level (0.05) and degrees of freedom (38), indicating that the differences are random and statistically non-significant. This confirms the equivalence and homogeneity of the sample.

The research instruments used included

a medical scale, a measuring tape, gymnastics mats, performance evaluation forms, a camera with a stand, and CD discs.

Procedures

Research Tests (Firdous Majeed, 2015):

Cat Jump Test:

The cat jump is considered one of the easy jumps and is therefore introduced to beginners. It is performed on the floor mat and can also be used on the balance beam apparatus. In this test, the learner raises one leg to an angle of (90°), such that the knee joint is level with the hip angle. When lowering the raised leg, the other leg is lifted, while the arms are extended laterally to the sides. The movement resembles that of a cat's jump. The performance is scored out of 10 points.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

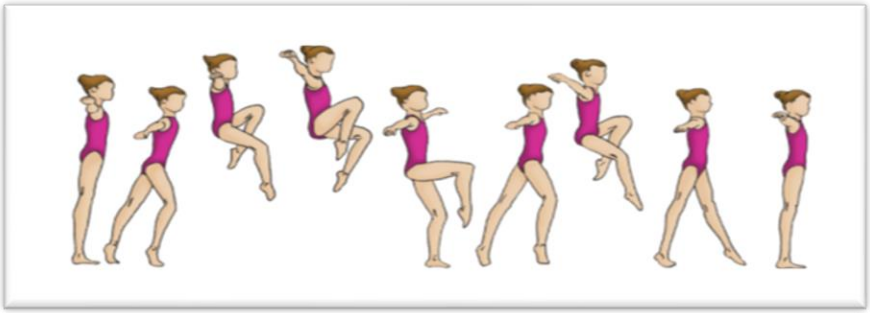

Figure 1. *Cat Jump*

Scissor Jump

As the name indicates, the movement resembles the crossing motion of scissors. The learner raises the right leg forward to a high position, then lifts the left leg so that the two legs cross in the air. The right foot lands first, followed by the left foot in front of it, while the arms are extended laterally to the sides. The movement is performed at the level of the hip joint (Members and Students). The performance is scored out of 10 points.

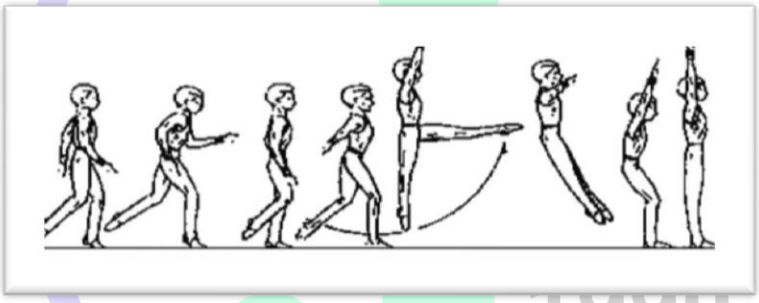

Figure 2. *Scissor Jump*

Wolf Jump

This jump does not differ in value or level of difficulty from the other jumps. From the take-off, the learner raises the right leg extended, with the body slightly bent forward and the arms extended forward. The second leg is kept close to the right leg, flexed, with both legs positioned at the same horizontal level. Performance was evaluated out of 10 points by three evaluators.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Figure 3. *Wolf Jump*

Table 2. *Shows the scientific bases of the skill tests*

Skills	Reliability Coefficient	Validity Coefficient	Objectivity
Cat Jump	0.82	0.90	0.92
Scissor Jump	0.85	0.95	0.94
Wolf Jump	0.90	0.88	0.94

Reliability was established by administering the test and re-administering it to a sample of 20 female pupils drawn from outside the main research sample. Validity was determined using self-validity, and objectivity was also verified, as shown in Table (2).

The researcher conducted a pilot study on 25/9/2025 with a sample of 10 female pupils who were not part of the original research sample and were excluded from the main experiment. The pilot study helped the researcher determine the appropriate time required to perform the skills.

The pre-tests were administered to the main research sample for both the control and experimental groups on 26/9/2025 for the study variables under investigation. The main experiment was conducted on 27/9/2025 with a sample of 40 female pupils divided into two groups: a control group (20 pupils) taught using the conventional method, and an experimental group (20 pupils) taught using active learning. The experiment was applied only during the main part of the instructional units, which lasted 30 minutes. The instructional units designed for the jumps consisted of 8 units implemented over a period of 4 weeks (Appendix 1).

The post-tests were conducted on 28/10/2025 for the skill tests on the main research sample for both the control and experimental groups. Statistical data were processed using the Statistical Package for the Social Sciences (SPSS).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Results

Table 3. *Shows the means, standard deviations, and calculated and tabulated t-values for the pre- and post-tests of skills for both groups*

Skills	Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Calculated *t*	Tabulated *t*	Significance
Cat Jump	Experimental	4.5 ± 1.2	8.00 ± 3.3	9.00	1.72	Significant
	Control	3.3 ± 1.00	6.00 ± 2.2	4.50		Significant
Scissor Jump	Experimental	5.2 ± 1.5	7.25 ± 2.00	7.80		Significant
	Control	4.0 ± 0.3	5.5 ± 0.88	4.30		Significant
Wolf Jump	Experimental	4.3 ± 0.2	7.20 ± 2.15	10.15		Significant
	Control	2.9 ± 0.5	5.00 ± 0.30	4.60		Significant

Table 4. *Shows the means and standard deviations of the post-tests for both groups in the skills*

Skills	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	Calculated *t*	Tabulated *t*	Significance
Cat Jump	8.00 ± 3.3	6.00 ± 2.2	4.00	1.69	Significant
Scissor Jump	7.25 ± 2.00	5.5 ± 0.88	6.22		Significant
Wolf Jump	7.02 ± 2.15	5.00 ± 0.30	5.90		Significant

Discussion

The researcher attributes the superiority of the experimental group to the effect of using active learning, which is characterized by ease of presentation and accuracy in delivering information related to skills. This approach helped stimulate the pupils' interest, motivated them to exert effort in learning, and reduced feelings of boredom. Active learning relies on learner positivity and interaction within educational situations and follows a logical, sequential process. It begins with the thinking stage, during which the teacher poses a question or idea and allocates time for reflection, followed by the pairing stage, where each pair of pupils discusses their ideas together. This is then followed by the sharing stage, in which each pair interacts with another pair and exchanges views regarding skill learning.

The nature of the selected skills is relatively simple for the pupils; therefore, enthusiasm, motivation, and a love of competition were evident, and learners interacted

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

actively within and among all groups. This indicates the effectiveness of the learner-centered approach. Teaching through active learning indeed leads to the desired change, namely achieving the planned objectives of the subject, whether cognitive or skill-based (Mohammed Rashid, 2009).

The researcher believes that the improvement in the skill level of the experimental group resulted from active learning, which helped pupils use the information they acquired through self-reliance. Moreover, passing through the stages of learning enabled pupils to understand information more clearly and sequentially compared to other methods. Active learning also contributes to the development of critical thinking, comprehension, and the ability to use learned information and knowledge in different situations, in addition to the teacher's role in providing feedback and guiding pupils during the exploration phase (Nadia Abbas, 2022).

The researcher further notes that active learning builds knowledge through feedback and the integration of information, which helps accelerate learning and save time. When a pupil works within a group, mutual support and encouragement increase self-confidence and the desire to attempt performance even after initial failure. This intrinsic motivation is considered crucial for performing movements that require balance and courage (Trigueros et al., 2020).

Active learning strategies, particularly cooperative learning, not only improve motor performance but also contribute to the development of social, emotional, and cognitive dimensions among learners, thereby enhancing the quality of comprehensive learning within the educational environment. Accordingly, it can be concluded that using active learning approaches in teaching gymnastics is among the best educational practices that contribute to developing pupils' performance at both the skill and psychological levels, while also enhancing their positive participation during lessons.

Conclusions

Teaching through active learning has a positive effect on learning and developing the level of skill performance in gymnastics among the research sample. There were statistically significant differences between the experimental group, which learned according to the active learning approach, and the control group, in favor of the experimental group. The study recommends using active learning as one of the modern instructional approaches for teaching gymnastics skills and conducting similar studies on other sports skills and with different samples.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Appendix (1)
Sample Instructional Unit for Learning the Cat Jump Using the Active Learning Approach

Grade: Fifth Grade (Primary)
Time: 45 minutes
Topic: Teaching the Cat Jump
Place: School Yard
General Objective:
The pupil performs the cat jump correctly from a standing position, with an emphasis on enhancing cooperation.

Section	Time	Formations	Repetitions	Duration	Notes
Main Section					
Instructional	10 min (within 30 min total)	Interactive discussion	4–6 repetitions	3–5 min	Explaining the skill through discussion and asking questions such as: What is the cat jump? When is it used? Explaining the skill using an illustrative board, video, or pictures. Clarifying the correct position of the hands and legs, emphasizing proper knee flexion and safe landing.
Practical	20 min	Small groups (3–4 pupils)	—	—	Pupils are divided into small groups. Each group attempts to imitate the cat movement in place while observing each other and correcting errors. Individual performance on the mat in front of the teacher. Each pupil performs the jump and landing, with rotation among pupils. Emphasis on providing feedback.
Feedback	—	Group discussion	—	—	Asking pupils questions such as: What made you feel comfortable while performing the skill? What could be improved?

Sample Instructional Unit for Learning the Scissor Jump Using the Active Learning Approach

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Grade: Fifth Grade (Primary)
Time: 45 minutes
Topic: Teaching the Scissor Jump
Place: School Yard
General Objective:
The pupil performs the scissor jump correctly, with an emphasis on participation and discipline.

Section	Time	Formations	Repetitions	Duration	Notes
Main Section					
Instructional	10 min (within 30 min total)	Interactive discussion	4–6 repetitions	5 min	Explaining the skill through discussion and asking questions such as: What is the scissor jump? When is it used? Explaining the skill using videos or pictures. Clarifying the correct position of the hands and legs, emphasizing proper leg extension. Focus on balance and dynamic movement.
Practical	20 min	Small groups (3–4 pupils)	—	—	Pupils are divided into small groups. Each group attempts to apply the scissor jump in place, observing each other and correcting errors in front of the teacher. Each pupil performs the skill and landing, with rotation among pupils. Individual performance with encouragement of self-correction or peer correction under teacher supervision.
Feedback	—	Group discussion	—	—	Asking pupils questions such as: What made you feel comfortable while performing the skill? What could be improved?

Sample Instructional Unit for Learning the Wolf Jump Using the Active Learning Approach

Grade: Fifth Grade (Primary)
Time: 45 minutes

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Topic: Teaching the Wolf Jump
Place: School Yard

Section	Time	Formations	Repetitions	Duration	Notes
Main Section					
Instructional	10 min (within 30 min total)	Interactive discussion	3–5 repetitions	5 min	Explaining the skill through discussion and asking questions such as: What is the wolf jump? When is it used? Explaining the skill using videos or illustrative pictures. Clarifying the correct position of the hands and legs, emphasizing full extension of the right leg and flexion of the left leg. Ensuring appropriate warm-up periods.
Practical	20 min	Small groups (3–4 pupils)	—	—	Pupils are divided into small groups. Each group attempts to apply the wolf jump in place, observing each other and correcting errors under the teacher's supervision. Each pupil performs the skill, with rotation between groups. Emphasis on continuous feedback.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Performance Correction & Feedback	—	Group discussion	—	—	Asking pupils questions such as: What made you feel comfortable while performing the skill? What could be modified or improved? Emphasis on corrective feedback.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

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Volume 38 – Issue (1) – 2026 Open Access
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The Relationship Between Some Kinematical Variables and Accuracy of the Spike in Volleyball for Ages (14–16)

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Abstract

The volleyball spike has been widely recognized as one of the fundamental skills that influence match outcomes. The performance of this skill is largely a function of the orchestration of several biomechanical factors including: angular and linear velocity of the power-arm, launch angle, ball height to the point that it is struck and step stop technique. The purpose of this research was to investigate the influence of these variables in accuracy of spike related to volleyball players in the age group 14-16. The study was descriptive in nature, involving a sample of 7 players from the National Talent Development Centre. Spike accuracy was assessed with the modified high spike test, which evaluates the speed as well as the accuracy of the spike. Biomechanical parameters - i.e. angular speed, peripheral speed, launch angle, ball height at the moment of the strike and foot deviation - were recorded using technological equipment such as high-speed video imaging systems and Kinovea software. The results demonstrates high and significant correlation between biomechanical variables and the accuracy of the spike and equipment contributed to increase angular speed (r = 0.899, sig = 0.006) peripheral velocity (r = 0.965, sig =.000), by ensuring increased accuracy with a projectile in the construction phase. There were also positive outcomes for launch angle and ball height at impact, indicating the significance of these factors for spike accuracy enhancement.

Keywords: Biomechanics, diagonal spike, motion analysis, kinematic variables, ball height.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Introduction

The spike is one of the basic technical skills in which the execution accuracy and coordination to a number of biomechanical variables are mainly influence match results. A number of things can impact this and timing including angular velocity it is imparted to the back arm, the tangential velocity along an arm release accident, back hand release angel ball height as contacted for payoff and stopping step. The purpose of this study is to determine how these biomechanical variables influence the spike accuracy in 14-16 year old volleyball players.

The angular and tangential velocities of the striking arm plays important role in determining power and speed of the hit that effect ultimately in accuracy of ball's direction (Al-Fahd, 2014). Based on a number of studies it has been reported that stronger spike can be generated when the ball's angle is consistent with the optimal ball angle at wrist-cock position (Al-Zahrani, 2016). A study by Kugel et al. (2019) also showed that the higher angular velocity of the striking arm contributed to efficient production of force used in spike, affecting the ball's accuracy and direction.

In terms of the ball release angle, it is regarded as one of the crucial factors to drive a ball in the direction toward the target, since launching a ball at an appropriate angle can result in enhancing spike accuracy (Al-Tuwaijri 2017). It has been reported that the correlation between release angle and ball's height at the impact moment was significant for enhancing spike accuracy among novice and intermediate players in this age group of interest (Al-Mutairi, 2018). In this connection, Filaire et al. (2020), the angle of ball release in spiking is critical for the final velocity direction of the ball, which in turn affects its accuracy.

Moreover, the stopping action is identified as one of the basic mechanical elements of controlling his balance before performing spike, which efficiently stabilizes the body and increases spike accuracy (Al-Salem, 2015). It has been found that by bettering the stopping step, overall stability and control of the striking action is enhanced such that consistent performance accuracy becomes more likely. Hughes et al. (2016) also reported that the stopping phase promotes balance and implies force distribution throughout the body, increasing the efficiency to perform precise and powerful spikes.

It is of course, known that some biomechanical factors influence spike accuracy. There are, however, relatively few studies considering the influence of these variables in young volleyball players aged 14–16 years. Thus, the present was undertaken to identify the degree in which angular velocity and tangential speed of the striking arm (our independent variables), ball release angle, ball height at contact and stopping step (control variables) influence spike performance in this age group. It's a pivotal time for the budding and shaping of motor skills. Additionally, findings from this study are anticipated to

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

inform coaches and researchers toward training practices that could enhance technical performance of players by targeting these kinematic variables.

Methodology

The purpose of this study was to describe the relationship between spike accuracy in volleyball and a set of selected biomechanical variables for young players affiliated with the National Center for Sports Talent Development aged 14–16 years during the 2024–2025 season. The sample was composed of seven players who presented dominance in the spike, 50% of the population selected.

Modified High Spike Test (Kadhim & Atea, 2023)

The purpose of the test was to measure the effectiveness and image velocity of high diagonal spike coming from position (4). The test was performed with a standard volleyball court, official volleyballs, and machine ball thrower as well as colored tape on the floor to delimit the movement area of the player (from which volition jump) and the ball landing zones (130 × 130 cm). A time limit of the ball was obtained using a high-speed camera (120 frames/s).

Performance specifications

The examined player completed the spike from a marked position to the opposing court on a diagonal of it, so that due to over-net trajectory speed, the ball landed within specific zones depending on prescribed accuracy. Non-recorded attempts failed when the ball did not fall into the accuracy zones, hit the net or a legal fault in terms of skill requirements. The player had to jump from the marked area in order to have the same base of movement for all participants.

Each player was given five attempts. Scoring was as follows:

- 4 points for the farthest accuracy zone
- 3 points for the next zone
- 2 points for the nearer zone
- 1 point for the nearest and largest zone
- 0 points for attempts that did not meet the specified conditions

The total score was calculated from the score of each accuracy zones by the time (s) taken by ball flight from hitting to arriving at accuracy zone using camera observation that analyzed Kinovea software. The measurement unit was (a score/second).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Kinematic Variables

- **Angular velocity of the striking arm:** The angular velocity of player's arm rotation during spike performance, is the rate of change of angular displacement in degrees per second. It is a measure of the velocity of the arm rotation and a strong correlate with performance power and accuracy (Hall, 2015).
- **Tangential velocity of the striking arm:** The rate at which the distal point (hand or wrist) is moving along its linear path during the spike, m/s. It is this velocity that determines how quickly the hand moves through space, and it is a product of angular velocity (ω) and arm length (Knudson, 2007).
- **Ball release angle:** The orientation of the ball relative to the ground at any instant after leaving a player's striking hand. This angle is crucial in hitting the ball, being able to hit over the block and consistency (Bartlett, 2007). The angle was defined by the line connecting across multiple frames of a ball's center of mass and to a vertical reference line and normalized to account for differences between positive and negative release angles.
- **Ball height at the moment of contact:** The vertical height of the ball from ground level at the instant of contact by the player in spiking (m). This feature is associated with the contact point of the player and the ball, which would directly affect the attack angle and aiming (Lees 2002).
- **Stopping step:** The value of the angle between front and rear forefeet-hooves line and ground.

A pilot study to check the assumption was performed with two players who were not part of the sample on Friday, 22 March, 2024 at time 10:00 a.m. at National Center for Sports Talent Development court. The aims of the pilot test were to confirm the capabilities of ball-throwing machine, estimate the number of cameras, distance and height setting for the camera system; prepare ready-made court conditions, indicate assisting team members, their quantity as well establishing their functions during testing process; specify execution time of exercise (the actual test) and validate effectiveness of assisting staff.

The actual test was then administered in the auditorium of the National Center for Sports Talent Development in Baghdad on Monday, the 24/3/2025 at 4:00 p.m., and it took about an hour and a half.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Results

Table 1. *Correlation coefficients between biomechanical variables and spike accuracy*

Variables	Correlation coefficient with accuracy	Sig. value
Angular velocity	0.899**	0.006
Tangential velocity	0.965**	0.000
Release angle	0.791*	0.034
Ball height at moment of contact	0.790*	0.035
Foot deviation	0.878**	0.009

Significant at Sig. < 0.05.
Coefficients marked with (**) are statistically significant at the 0.01 level.
Coefficients marked with (*) are statistically significant at the 0.05 level.
Sample size (N = 7) for all variables.

Discussion

There was a positive, significant correlation between angular velocity and accuracy in the results (r = 0.899**, sig = 0.006) suggesting that performance becomes more precise at faster velocities of movement. This may be attributed to the function of angular velocity in its acceleration of joint rotation during arm and shoulder movements, hence facilitating efficient transfer of kinetic energy from body to ball at throw. This improves spike effectiveness and reduces movement dispersion, increasing accuracy. Bartlett (2007) stated that angular velocity was important for sports in which precise control of the direction and magnitude of limb movement was necessary, like volleyball. The higher the angular velocity, the more effectively kinetic energy is transferred from muscles to the ball for spiking and serving in volleyball. These results are consistent with those of the present work, which showed that angular velocity was significantly correlated with accuracy.

The correlation of accuracy with tangential velocity was the strongest when compared to other variables (r = 0.965**, sig = 0.000) implying that enhancing the linear motion speed of body segments especially upper limb naturally leads to increased performance in terms of high precision movements. Tangential velocity, in biomechanics, refers to the speed of a point on an arm or hand as it travels along its linear path. Consequently, regulating this speed better regulates the direction and distance of striking and the force applied during striking-all important to precision. Knudson (2007) supports the results of the present study indicating that with control over tangential velocity, direction and distance control can be higher in sports such as volleyball, leading to greater accuracy of execution. As well, the transfer of energy by the upper limbs also depends on average tangential velocity, which directly affects impact onto the ball in hitting. Salama

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

(2009) also found that tangential velocity plays a major effect in the accuracy of team sports through influencing direction and strength of the ball; thus it is a critical effectiveness factor toward accuracy.

A strong positive statistically significant correlation was observed between accuracy and release angle (r = 0.791*, sig = 0.034), which suggests the importance of an optimum release angle for good ball trajectory accuracy. Biomechanically, release angle of the projectile has a specific effect on the path and trajectory of the ball such that any differentiation from this angle leads to changes in ball height and range affecting target accuracy (Hay, 1993; Al-Kubaisi,2013).

Moderate and statically significant correlation between the ball height (at the impact instant) and precision (r=0.790*, sig = 0.035), suggests that point of impacts also plays an important role in predicting the behavior of ball on its release. The height of the ball at the time of impact has a significant influence on release angle and force placement and timing. Landing errors may also lead to a loss of ball control and thus accuracy (McGinnis, 2013; Hameed, 2014).

There is a strong, significant relationship in foot deviation with accuracy (r = 0.878**, sig = 0.009) suggesting that the alignment of the foot in the execution has an effect on ball placement and where it goes. It emphasizes the need to coordinate body axes and alignment of the foot towards the target. A movement of the foot in advance or during striking will carry energy out of a best line and thus reduce precision (Zatsiorsky & Kraemer, 2006).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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An analytical study of neuromuscular coupling at maximum load for weightlifters utilizing high-density electromyography of the surface for the snatch lift

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Abstract

this study aimed to analyze the characteristics of the neuromuscular coupling during maximal load performance (100% maximum performance of one-repetition) in the snatch lift among weightlifters, by using a high-density surface electromyography (HD-sEMG). The study adopted a descriptive analytical approach that have a correlational nature which included a sample of 12 weightlifters from the Al-Kadhimiya Sports Club with at least five years of training experience. The electrical activity (of the two main muscles involved in the second pull phase of the snatch lift, namely the vastus lateralis and the gluteus maximus), has been recorded, along with the analysis of motor unit discharge rate and muscle fiber conduction velocity by using an advanced decomposition algorithms. The results showed a strong correlation between the maximum strength and the neural discharge rate in the vastus lateralis muscle, as well as a significant correlation between the fiber conduction velocity in the same muscle and maximum strength (1RM) in the snatch lift. In addition, a moderate correlation has been also observed between the discharge rate in the gluteus maximus muscle and maximum strength, but the conduction velocity in this muscle has not reached the level of statistical significance. However, the main conclusions that have been based on the study's results indicate that neural efficiency, (particularly the regulation of discharge rate with the recruitment of high-threshold motor units during the second pull phase of the snatch lift), represents a fundamental determinant of strength production under maximum loads.

Keywords Neuromuscular coupling, high-density surface electromyography, motor unit discharge rate, muscle fiber conduction velocity.

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Introduction

Performance in Olympic weightlifting is a direct reflection of the functional integration between the nervous and muscular systems, especially when executing a maximum load approaching 100% of the one-repetition maximum (1RM). The ability to produce maximum strength becomes the result of a complex interaction between neural recruitment mechanisms and the mechanical properties of muscle fibers. The neuromuscular coupling represents the degree of correlation between the neural activity originating from the central nervous system and the mechanical response produced in the muscle fibers. The efficiency of converting signals into force is a very important thing to consider when we are talking about muscle movements and neural signals. Research shows that how well the neural signals and the muscle movements work together is really crucial when the load is heavy. This is because if the neural signals and the muscle movements are not in sync it can affect how much force is produced. The researchers Enoka and Duchateau found this out in 2023. So did Farina and his team in 2023.

This is closely related to how the motor units behave and how often they send signals to the muscle fibers. To lift the load the body needs to use the high-threshold motor units. The body needs to send signals to these high-threshold motor units often to keep the force at the right level. The neural signals and the muscle movements need to work to make this happen and the motor units play a big role, in this process especially the high-threshold motor units. Studies have found that small changes in how these signals are sent can affect an athletes ability to reach their peak force when trying their hardest (Del Vecchio et al., 2023; Martinez-Valdes et al. 2023).

The speed at which signals are sent through muscle fibers is an indicator of how well the body can transmit electrical signals. This speed is related to the type of muscle fibers the fast-twitch type II fibers, which are very important for producing a lot of force quickly like in snatch and jerk movements. Research indicates that changes, in this speed when lifting loads may show how tired the muscles and nerves are or how well the nerves have adapted in elite weightlifters. (Holobar & Farina, 2023; Negro et al., 2024). With the technological advancement in measurement tools, high-density surface electromyography has enabled the analysis of muscle electrical activity with high temporal and spatial precision thru the use of multi-electrode arrays and the application of advanced decomposition algorithms that allow for the analysis of each motor unit's behavior individually. This represents a qualitative advancement compared to the traditional analysis of the root mean square of the electrical signal, which does not directly reflect the individual characteristics of the motor units (Farina et al., 2023; Vigotsky et al., 2024).

The study of these variables is particularly important for Olympic weightlifters, as the success of a lift attempt at maximum load depends on the instantaneous integration of the complete recruitment of high-threshold motor units, the high rate of neural discharge,

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

and the efficiency of fiber conduction, as well as the precise temporal coordination between neural and mechanical components during the stages of rapid motor performance. Understanding how our muscles and nerves work together is really important if we want to figure out why some people are better at things than others. This is especially true when we are talking about people who're really good at something. We need to know what is happening in their bodies that makes them so good; We are looking for things like heart rate and other signs that show when someone is performing at their best. Understanding the connection between our nerves and muscles is key. to finding these signs and knowing what makes someone a high performer.

The study of how muscles and nerves work in weightlifters when they are lifting the most weight they can is really important. This is because it can help us learn more about how the brain controls the body when it is working hard, Weightlifters need to use all their strength when they are competing, By using equipment to measure the activity of the muscles we can learn more about how the nerves and muscles work together. This can also help us understand how the muscles are working when they are moving fast. The information we get from this study can be used to help athletes train better and to check if they are getting tired or hurt. It can also help us develop ways to get the nerves and muscles ready for competition. The study of coupling in weightlifters is very useful for athletes who want to be the best. Neuromuscular coupling is very important, for weightlifters. Furthermore, it contributes to supporting local scientific research in the field of strength sports physiology.

The problem of the study lies in the fact that, despite the critical importance of maximum load in determining the performance level of weightlifters, the understanding of the neuromuscular mechanisms accompanying the performance of the snatch and jerk at an intensity of 100% of the one-repetition maximum remains limited, particularly concerning the behavior of motor units and conduction velocity in muscle fibers during dynamic performance. Moreover, the majority of previous studies relied on traditional electrical indicators do not accurately reflect the nature of the neuromuscular coupling under maximum effort conditions. Based on this, the research problem lies in the ambiguity of the characteristics of this neuromuscular coupling in weightlifters at maximum load, and the need to analyze it by using high-density surface electromyography to reveal the patterns of motor unit discharge, and fiber conduction velocity under these conditions.

The research aims to

1. identifying the nature of the neuromuscular coupling at maximum load (100% of the one-repetition maximum) in weightlifters.
2. Analyzing the discharge rate of motor units during maximum load performance using high-density surface electromyography.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

3. Measuring the conduction velocity in muscle fibers during a maximal lift attempt.
4. Determining the relationship between neuromuscular discharge indicators, fiber conduction velocity, and maximum strength (1RM) in the snatch lift.

Research hypotheses

1. There is a statistically significant correlation between neuromuscular coupling indicators measured by high-density surface electromyography (HD-sEMG) and maximum strength (1RM) in weightlifters at maximum load.

2.The indicators of motor unit activity and muscle fiber conduction velocity significantly contribute to the maximum strength level when performing at 100% 1RM intensity.

Methodology

The study adopted a descriptive analytical method with a correlational nature, suitable for the research problem aimed at analyzing the characteristics of neuromuscular coupling during performance at maximum load (100% of the one-repetition maximum) in weightlifters during the snatch, and revealing the relationships between neural variables (motor unit discharge rate, fiber conduction velocity) and the mechanical variables associated with performance.

Research Sample

The research sample consisted of 12 weightlifters from the advanced category of Al-Kadhimiya Sports Club for the 2025/2026 sports season, and they were selected intentionally to align with the study's requirements. It was required that the sample members be:

- They have at least 5 years of training experience in Olympic weightlifting.
- Capable of performing the snatch lift at maximum load in an approved legal manner.
- Free from muscular or neurological injuries during the six months preceding the study.
- Not undergoing any medical or therapeutic rehabilitation programs that may affect neuromuscular activity.

The sample members were informed about the nature of the research procedures and their objectives, in addition, their written consent to participate was obtained, with an emphasis on the confidentiality of the data and its use for scientific research purposes only.

Table 1. *Between The Sample Characteristics in The Variables (Age, Mass, Training Age)*

The variable	mean	SD	Skewness

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Age (years)	23.75	2.14	0.42
Mass (kg)	78.30	6.85	-0.36
Training age (years)	7.25	1.48	0.58

It is clear from Table (1) that the skewness values fell within the range (±1), indicating a moderate distribution and homogeneity among the sample members in the studied variables.

The devices and tools used

1- 20 kg weight plates, 12 pieces.

2- Multiple Olympic weights of (0.5, 1, 1.5, 2, 2.5, 5, 10, 15, 20, 25) kg. In addition to a legal lock weighing 2.5 kg.

3- A platform for performing the snatch lift.

4- Device (HD-sEMG) of U.S. origin

Variables and their operational definitions

- **Neuromuscular Coupling**

It is the integrated functional interaction between the nervous system and the skeletal muscle, which is manifested in the conversion of the neural signal emitted from the central nervous system into a muscular mechanical response that produces force, and It is measured through indicators of motor unit activity, fiber conduction velocity, and neural recruitment efficiency during motor performance.

- **Discharge Rate**

It is the number of nerve impulses fired by the motor unit per unit of time, usually measured in electrical signals per second (Hertz), and it reflects the level of central nervous activity directed toward the muscle during performance.

- Muscle Fiber Conduction Velocity:

It is the speed of action potential transmission along the muscle fiber, measured in meters per second, and represents an indicator of the functional properties of muscle fibers and the level of neural excitability.

- Achieved Maximal Load:

It is the maximum weight that the player can successfully lift once with correct technical performance, expressed as 100% of the one-repetition maximum (1RM).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

The selected muscles in this study are the core muscles, including

1- The quadriceps muscle: specifically (Vastus Lateralis and Quadriceps Femoris) It is one of the most important muscles in the second pull phase, high in density of type II fibers.

Ideal for measuring fiber conduction speed, which is the most commonly used muscle in the global disassembly of motor units.

2- Gluteus Maximus

It is the primary source of hip extension strength, crucial for generating explosive power, reflecting the integration between the central nervous system and the core muscles, and very important for understanding the coupling in the transitional phase from pull to full extension.

The tests used

1- Snatch Test

The snatch test was conducted on the research sample, and through a specific registration form that includes the name of the lifter and the number of attempts (which are three attempts), three attempts were given to each individual in the sample in which The best lift among the three attempts was selected, which is the internationally recognized protocol for selecting the best lift. Prior to the test, the sample members performed adequate warm-up exercises (Omar Khaled, 2014).

2- Muscle electrical activity test (HD-sEMG) (Yasir, O. K., Ali, M. H, 2025)

A high-density surface electromyography (HD-sEMG) multi-channel device was used. The athlete is asked to perform a small jump or a light bar strike before the lift, which shows a sudden spike in the force signal and an EMG spike. The two points are temporally matched during the analysis.

Field experiment procedures

This design is based on the direct measurement of muscle electrical activity using High-Density Surface EMG during the execution of maximum lift attempts in the snatch lift.

The measurements took place in a controlled lab at the Kazimiya Sports Club hall. The conditions for performance like warm-up rest periods and the order of attempts were kept the same for everyone to ensure that outside factors didn't affect the results. Participants did a one-repetition test, which was done according to a set protocol. They did a lifting attempt at one hundred percent of their maximum. The muscles they used which are the quadriceps and gluteus maximus muscles had their activity recorded with special equipment that has many electrodes. The electrical signals were then looked at using

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

computer programs. These programs helped figure out more about the motor units like how the motor units send signals and how fast the muscle fibers send signals. The quadriceps and gluteus maximus muscles were what they focused on. The results showed how these muscles work when someone is lifting. They also recorded the strength in kilograms to see how neural variables and maximum strength are related. The HD-sEMG signals were broken down using an algorithm and motor units were only included if they were broken down accurately at least ninety percent and the signal-, to-noise ratio was good enough to make sure the results were reliable.

The second pull phase of the lift was the part they looked at for electromyographic analysis. This is because it is the part where someone needs the strength and neural recruitment. They defined this phase by looking at the movement of the lift using a speed digital video camera that was placed at an angle to get a clear view of the bars path.

The second pull started when the bar began to speed up after passing the knee level.

This happened when the hip and knee joints changed from partially straight to straight moving fast. The bars explosive acceleration marked the beginning of the pull. It coincided with the hip and knee joints going from extension to full extension quickly.The moment the bars speed increased rapidly after the knee level was key.

The hip and knee joints were transitioning to accelerated extension at this point. The second pull began with the bars acceleration. The hip and knee joints were changing from partial to extension. The bar sped up quickly after the knee level starting the pull. The hip and knee joints moved from extension, to accelerated extension then. The end of the phase was defined at the moment of full triple extension (hip, knee, and ankle) and just before the athlete began to transition under the bar.

The high-density surface electromyography (HD-sEMG) signals were synchronized with the video recording using a common time index within the system. Then, the time-matched window for the second pull phase was extracted to isolate the neuromuscular activity associated with peak performance at 100% of the one-repetition maximum. The movement segments were analyzed by two experienced judges in the field of weightlifting training, and the average time determination between them was adopted.

The researcher conducted a pilot survey (study or experiment) on a small sample of two quadriceps to ensure the validity of the tests and to identify any errors encountered to avoid them. The pilot survey (study or experiment) was conducted on 8-1-2026 to ensure the preparation of the necessary requirements for the main experiment, including the availability of weights and the supporting team, to address the organizational aspects of the tests, verify the validity of the

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

laboratory devices and tools, and identify any obstacles that may arise during the experiment.

After completing the pilot survey (study or experiment), the researcher conducted the main tests on 9/1/2026, and he began conducting the tests (maximum strength and high-density surface electromyography) simultaneously, with the specialized team, at three o'clock in the afternoon.

Statistical methods

The researcher used the Statistical Package for the Social Sciences (SPSS) to process the data. The data were statistically processed using descriptive methods (mean, standard deviation), and appropriate significance tests for the nature of the variables, as well as correlation coefficients between neuromuscular coupling indicators in explaining the variance in maximum strength at maximum load, at a significance level of (0.05).

Results

Table 2. *It shows the maximum strength of the snatch lift.*

The variable	Unit	Mean	SD
1RM Snatch	(kg)	118.5	12.7

Table 3. *Indicators Of Neural Activity During The Second Withdrawal Phase*

The variable	Unit	Mean	SD
Discharge rate – vastus lateralis	(Hz)	24.6	3.1
Conduction velocity – vastus lateralis	m/s	4.28	0.41
Discharge rate – gluteus maximus	(Hz)	22.9	2.7
Transmission speed – gluteus maximus	m/s	4.11	0.36

Table 4. *Correlation Coefficients Between Neural Discharge Indicators And Maximum Strength (1rm) In The Snatch Lift*

The variable	Correlation coefficient (r)	Level of significance
Discharge rate – vastus lateralis	0.71	0.009

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Conduction velocity – vastus lateralis	0.64	0.020
Discharge rate – gluteus maximus	0.58	0.040
Transmission speed – gluteus maximus	0.49	0.090

Discussion

Table (2) shows that the maximum strength level in the snatch lift reached (118.5) kg among the sample individuals, reflecting a high capacity of the neuromuscular system to produce maximum strength during a complex and multi-joint motor task. The performance you get in the snatch especially when you are lifting the weight you can really depends on how well you can use the strong muscle fibers and how well the nerves in your body work together to make the muscles work. If you look at what people have written about this you will see that being good at lifting the maximum weight you can is more about your nerves getting better at working together than it is about just building bigger muscles especially for athletes who are already very good at what they do, in the snatch (Negro et al., 2024; Duchateau & Enoka, 2023). The strength that athletes have is really high because their bodies have changed in ways. This is because they have been training for a time. The results show that athletes can move their muscles faster and their nerves can send signals quicker. This is happening because the motor cortex and the pyramidal system in their brains have changed. The motor cortex and the pyramidal system are getting better at working. This means that athletes can lift heavy weights and do it well. The motor cortex and the pyramidal system are very important, for strength training. They help athletes generate maximum strength when they are lifting absolute loads.

Table (3) shows that the discharge rate in the vastus lateralis muscle reached 24.6 Hz. The gluteus maximus muscle had a discharge rate of 22.9 Hz. These values indicate neural activity during the second pull phase. The vastus lateralis muscle had a conduction velocity of 4.28 m/s. The gluteus maximus muscle had a conduction velocity of 4.11 m/s. This stage is the demanding, for producing torque. It is also the stage where the bar accelerates or shifts. The motor units increase their firing frequency. This helps to maximize force. The increased firing rate shows this. Del Vecchio et al.

(2023) It has been shown that when muscles fire faster they can produce force quicker. This is really important for things that need to be done and with a lot of power. Also the speed at which signals are sent to muscles is linked to how big the muscle fibersre

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

how many fast-twitch fibers they have. These things are really important for being able to produce a lot of force in a short time like when you are doing something that needs to be done quickly and with a lot of strength. Muscle fiber diameter and the proportion of fast-twitch fibers in muscles are critical, for producing force in a short time. (Vigotsky et al., 2024).

The results of Table (4) The study found a strong link between how fast the muscles in the vastus lateralis fire and how strong someone is. The numbers showed a correlation of 0.71. This was significant at a level of 0.009. In studies about the body and how it works this is thought to be a link. It means that when the muscles fire faster people can lift weight. This is important for the lift. The study also checked how fast signals move in the muscles of the vastus lateralis.

It found that this is connected to how strong someone's too. The correlation was 0.64, which was significant at a level of 0.020. This result is similar to what Duchateau and Enoka said in 2023. They said that controlling how fast muscles fire is a way to get stronger when lifting weights. The discharge rate of the muscles in the vastus lateralis matters for maximum strength production, in the lift. This supports the role of the properties of fast fibers in improving explosive performance. Recent evidence using HD-EMG techniques shows that conduction velocity is an indicator of muscle fiber structure and its ability to produce force (Farina et al, 2023).

As for the gluteus maximus muscle, a moderate and significant correlation was observed between discharge rate and maximum strength, reaching (0.58) with a significance level of (0.040).

However, the conduction velocity correlation did not reach statistical significance, as it was (0.49) with a significance level of (0.090). This may reflect that the contribution of the gluteus maximus during the second pull phase is more related to its function in hip extension and force transfer, while the vastus lateralis remains more associated with generating torque around the knee joint. Recent studies in multi-joint task analysis indicate that the distribution of muscular contribution varies according to the instantaneous torque requirements at each movement phase (Martinez-Valdes & Falla, 2024).

In general, the obtained correlation values reflect a significant contribution of neural determinants in explaining individual differences in maximum strength during the snatch lift.

These results indicate that the efficiency in organizing neural discharge and coordinating the recruitment of high-threshold motor units during the second pull phase is a crucial factor in producing strength under high loads. Therefore how well you perform in this skill is not about how your muscles look or their size. It is more about how your brain controls

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

your muscles and how effectively you activate them. This matches what experts in strength and exercise science think about how athletes get better (Negro et al., 2024).

In short, our study found that being really good at the lift in weightlifting is mainly because of how well your muscles and brain work together during the most important part of the lift especially the second pull. We saw that how fast your muscles fire is key to producing a lot of force when you're lifting heavy. How fast signals travel through your muscles also matters, as it shows how well your fast muscle fibers work and that helps with performance.

Being great at the lift is more about how efficiently your brain controls your muscles and how well you activate the right muscles, not just about having big or strong muscles.

These findings fit with what we know about strength and exercise science, which says that how well your brain and muscles adapt to training is more important than just how your muscles look for being really good, at sports that require a lot of strength.

Conclusions

1. The study results show that the strongest weightlifters at Al-Kadhimiya Club have central nervous system regulation, which is what makes them so strong in the snatch lift not just because they have big muscles.
2. When weightlifters from Al-Kadhimiya Club do the lift, the speed at which their nerves send signals to their muscles especially in the second part of the lift is very important for making a lot of force and this shows how important the nerves are for being strong.
3. How fast the muscles of the weightlifters at Al-Kadhimiya Club work is also important for the lift because it helps us understand why some weightlifters are better than others and it has to do with how each muscle helps with the lift.
4. The study found that the second part of the lift is very important for using the nerves in the best way so it is a good way to check if a weightlifter is ready to lift.
5. The study results agree with what people think about strength, which's that the best weightlifters have nerves that work very well and this is what makes them so good at the snatch lift.
6. The study shows that how well the nerves work and how fast the muscles send signals are both very important for being strong at the lift especially for weightlifters, at Al-Kadhimiya Club who are trained to lift at their maximum strength.

Recommendations

1. We should do studies that follow people over time to see how their muscles and nerves change when they do types of training like weightlifting. This will help us understand how the nerves and muscles work together when people do exercises.
2. It would be really helpful to use tools like high-density electromyography to see what the muscles are doing when people lift weights. We should also use cameras to see how the body is moving when people do the lift. This will help us understand how the muscles and nerves work together when people lift weights.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

3. We need to learn more about the muscles in the back and the muscles that help keep the body stable. These muscles are important because they help people lift weights without getting hurt.
4. We should compare the athletes with the average athletes to see what makes the best athletes so good. This will help us understand what makes someone a great athlete and how we can help other people become athletes too.
5. Coaches should check the activity of their athletes on a regular basis to see if they are getting tired or if they are ready to compete. The neural activity is, like a signal that shows how well the nerves and muscles are working together.

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An Analytical Historical Study of the Most Important Iraqi Paralympic Table Tennis Results Achieved Globally for the Period (2023-2025)

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Abstract

The Paralympic Games are considered the third global sporting event after the Olympic Games and the second World Cup for football, as the Paralympic Games are not sports competitions, but are the embodiment of the spirit of humanity, and the research aims to 1- Analyze and know the most important results of Iraqi Paralympic table tennis achieved globally for the period (2023-2025). 2- Analyzing and knowing the most important factors that contributed to achieving the achievement The historical-analytical method was used, the study population: they are all Iraqi players participating in the Arab, international and Paralympic championships. The study sample: It was selected in a deliberate way and included the medalists accredited in the Arab, international and Paralympic countries.The most important conclusions 1- The Iraqi table tennis achieved an achievement and a historic leap from qualifying from the quarter-finals in Nafsat 2021 to the gold and dominating the throne of the game in Paris 2024, which confirms the efficiency of the training programs of the training staff in technical, psychological and tactical preparation, winning and deciding the result, and the most important recommendations came to provide material and technical support for equipment and artificial sports limbs and the development of sports talents to ensure the continuation of the Achievement

Keywords: Analytical Historical, Table Tennis, Paralympics.

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Introduction

Today, sports are the first important global event for all countries of the world, and in the modern era, sports have taken a prominent position, especially as it has become multi-role, as it is no longer limited to being a physical activity only, but has become one of the most important tools affecting global and international policies, as international festivals such as the Olympic Games and world championships in all sports are considered to have a vital impact, such as building roads and forming rings that connect countries to each other, as sports have been used. As a tool to strengthen the national and international image

(Sakran, 2024, p. 250) The Paralympic Games are the third global sporting event after the Olympic Games and the second FIFA World Cup, as the Paralympic Games are not sports competitions, but are the embodiment of the spirit of humanity

The Paralympic Games are the main component of the competitions, and due to the importance of the event, the list of sports has been expanded and more inclusive for people with disabilities, for half of this segment of society, and to integrate and rehabilitate them and change the reality of most of them, as for the Paralympic Games, since its establishment in the first session in 1960, it has been limited to (8) games with the participation of (23) countries and (400) athletes, and today the number of games participating in the last session in 2024 is (22) games and the participation of (169) countries and the number of participating athletes is (4463). (Najm et al., 2025, pp. 193-194)

Table tennis is one of the most popular sports in the world, and it has been included in the Olympic Games since 1988. Similarly, Paralympic table tennis is the third largest Paralympic sport in terms of the number of athletes, and is practiced in more than 100 countries (International Paralympic Committee [IPC], n.d.) that was officially included in the Summer Paralympics program in 1960.

Table tennis is one of the central federations of the Iraqi Paralympic Committee, which was established in 2003 after being linked to the Iraqi National Olympic Committee as a federation, which is the Al-Majd Sports Federation for Paralympics (Elias, 2020).
The reason for using the 2021-2024 time period is due to the Iraqi Paralympic team's first participation in the Tokyo Games in 2021.
The problem of the study is highlighted by the lack of information about this sport in academic research and central libraries in Iraqi universities, and the importance of this study lies in the fact that it is the first Iraqi study according to the researcher's knowledge that studies the development of the Iraqi Paralympic table tennis game during the research period from 2023 to 2025 and its participation in the Arab, international and Paralympic countries.

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https://jcope.uobaghdad.edu.iq

Study Objectives

1- Analyzing and knowing the most important results of the Iraqi Paralympic table tennis achieved globally for the period (2023-2025).
2- Analyzing and knowing the most important factors that contributed to achieving achievement

Methodology

This study is based on the historical-analytical method .

Study Population

They are all Iraqi athletes participating in Arab, World and Paralympic Championships.

Study sample

It was deliberately selected and included the medalists accredited in the Arab and international and Paralympic countries.

Data Collection Tools

Official Records of the Paralympic Committee.

Iraqi Paralympic Committee records, international participation files and ITTF reports.

Approved Paralympic databases.

Official reports of the Arab and international Paralympic Committees

Statistics issued by Paralympic sports federations

Personal Interviews

Iraqi Paralympic Committee

(Al-Itabi et al., 2021.p385) indicates that the Iraqi Paralympic Committee was established on April 9, 2003. The Faculty of Physical Education and Sport Sciences at the University of Baghdad witnessed the first meeting of the Interim Committee for the Management of Sport for Persons with Disabilities in Iraq, chaired by Ahmed Abdul Ghafoor Al-Samarrai, and in the presence of the member of the Interim Board, Dr. Faleh Francis. At that meeting, it was agreed to form an interim body for the management of disabled sports. Dr. Muzaffar Abdullah Shafiq was appointed as the coordinator between the Interim Authority for the Management of Disabled Sports and the Interim Authority for the Management of State Sports. The Interim Authority for the Management of the Disabled consists of: Qahtan Tayeh Al-Nuaimi, Dr. Dhari Touma, Fakher Al-Jamali, Khaled Rashak, Dr. Aqeel Hamid, Alaa Al-Din Moussa Al-Roudhan, Haider Amin, Siham Hassan, Dr. Karim Abis, and Mohammed Salman Tawfiq. Mohamed Majeed, Asaad Ismail, Hassan Reza, Dr. Abdulaziz Nayef, Abdulkarim Abdel Hussein, Abdulkarim Baqer, Samir Ali Latif, Qassem Shanshil, and Hadi Abdel Karim. October 9, 2003 is considered

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Volume 38 – Issue (1) – 2026 Open Access
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a historic day in the record of the Iraqi Paralympic Committee. The first elections were held for the ten federations, which in turn formed the organizational structure of the Paralympic Committee: weightlifting, athletics, sitting volleyball, fencing, chair swimming, target ball for the blind, table tennis, tennis, and games for the deaf and dumb. At that time, the Executive Bureau of the Iraqi Paralympic Committee was elected for the first time, which included Qahtan Tayeh Al-Nuaimi as president, and Fakhir Al-Jamali as Secretary General, Hani Abdul Majeed as First Vice-President, Khaled Rashaj as Second Deputy, Abdul Karim Baqer as Financial Secretary, Dr. Aqeel Hamid as Executive Director, Siham Hassan in charge of Women's Sports, Mazhir Ghanem as Vice Chairman of the Board of Directors, Nawfal Abdul Sattar and Kawthar Hussain as members of the Board of Directors, Dr. Zuhair Saudi as representative of the Ministry of Health, Mr. Mahmoud as representative of the Ministry of Labor and Social Affairs, and Dr. Faleh Francis as Coordinator with the Interim Sports Administration in Iraq.

Table Tennis Rankings

Paralympic table tennis players are divided into 11 categories of competition, according to their abilities. Wheelchair players compete in Categories 1 to 5 (C1-C5), standing players in Categories 6 to 10, and Players with Intellectual Disabilities in Category 11. Players in Categories C1 and C2 have the worst physical disabilities, including players with quadriplegia, while wheelchair players in Category C5 have the best physical abilities (International Paralympic Committee [IPC], 2025).

Najm et al., 2025, p. 196 indicates that table tennis was part of the Paralympic Games program Since the inaugural Games in 1960. With 10 countries participating in eleven competitions and involving 10 players and 15 female players, the sport of Paralympic table tennis is a popular event at the Summer Paralympic Games, where athletes with physical and mental disabilities participate. There are 11 player classifications (category) Classes 1 to 5 compete in a wheelchair, and classes 6 to 10 compete in a stand.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Results

Table 1. *Shows the Arab results of the Iraqi Paralympic table tennis*

	Name of Competitions	Competition History	Country (venue)	Achievements Gold, Silver, Bronze		
1	National Club International Championship	2023	**Jordan**	**1**	**5**	**4**
2	West Asian Championship	2024	**United Arab Emirates Sharjah**	**1**	**4**	**5**
3	Egypt International Championship	2024	**Egypt**	**1**		**1**
4	National Club Championship	2024	**Jordan**	**3**	**5**	**7**
5	Oman International Championship	2025	**Jordan**	**1**	**3**	**6**
6	Egypt Championship	2025	**Egypt**			**2**
7	Asian Youth Games Championship	2025	**United Arab Emirates**	**3**		**1**

Table 2. *Shows the results achieved globally for Iraqi Paralympic table tennis*

	Competition Name	Competition History	Country (venue)	Achievements Gold	, Silver , Bronze	
1	Taiwan Championship	2023	**Taiwan**	**1**		**1**
2	Korea	2023	**South Korea**	**1**		**1**
3	Asian Games / Hanzhou	2023	**China** Hangzhou City			**1**
4	Slovenia Championship	2024	**Slovenia**		**1**	
5	Nigeria Championship	2024	**Nigeria**	**6**	**2**	**7**
6	World Youth Championship	2024	**Slovenia** Laško City		**4**	**1**

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

	Competition Name	Competition History	Country (venue)	Achievements Gold	, Silver , Bronze
7	Montenegro Championship in Montenegro	2025	**Montenegro**		**1**
8	Slovenia Championship	2025	**Slovenia**		**1**
9	Zone Championship in China	2025	**China**	**1**	

Table 3. *Shows the results achieved in the Iraqi Paralympic Table Tennis Olympics*

t	Competition Name	Competition History	Country (venue)	Achievement
1	Tokyo Paralympics	2021	**Japan**	**Qualifying for the quarter-finals**
2	Paris Paralympics	2024	**France**	**Historic Gold**

Discussion

By looking at Table (1), it is noted that the readings in the competitions record an upward path in the results, which reveals the progress in the technical performance of the Iraqi Paralympic team in the Arab world, and the results can be understood and discussed through several axes: First, the recording of competitive excellence in the Jordanian championships from 2023-2025.

Therefore, the Jordanian stadiums have been a good point for excellence in competitive performance, and this did not come out of thin air, as communication is in development. Performance through contact with healthy people for the purpose of developing a superior training environment to reach the highest methods of good competitive skill performance, and this was evident through the results in Table (1), in 2023, the Paralympic table tennis team achieved (4 gold, 5 silver, 1 bronze). With the continuation of participation in 2024, the gold tally in the same tournament jumped to (7 gold medals), up to 2025 in the Oman International Championship, which recorded (6 gold).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

So, from four gold medals to seven medals for the Iraqi team, it reflects the level of understanding and cumulative competitive experience of the players, as well as the level of tactical and technical experience, as the players were able to know the technical mistakes due to which the team won five silver medals, and therefore in the next tournament 2024, this understanding translated into increasing the gold medals and keeping the silver and bronze, and turned them into decisive victories during consecutive tournaments.

Referring to Table (1) and following up on the Arab results in the UAE Championship, the Iraqi team is technically dominant by winning five golds and four silvers, as for the Egyptian stadiums, the achievement here is qualitatively accurate, with the Iraqi team 2025 winning two golds for the 2024 championship, one gold, so getting another gold is not an easy thing in the field of sports or competitions.

Here, we point out that the lack of loss in the final levels of the Egyptian Championship is an indicator of raising the level of psychological toughness of the participating Iraqi team and their ability to obtain gold medals under the pressure of competition for the opponent and the existing audience, and this is confirmed by (Jassim et al., 2024, p. 58) that the psychological aspect has a large part in reaching performance in less time and higher effort, and high effort does not come without a strong personality that knows the requirements of the learning stage, as psychological toughness is considered a valuable personality trait that enables the individual to Face the challenges of technical performance of difficult skills and help them achieve their goals and overcome obstacles.

From what is stated in Table (1), if we make a comparison of the competitions for the Iraqi participations, it is concluded that the Iraqi Paralympic team moved from the stage of appearance in 2023 to the stage of overwhelming victory in 2024-2025, and this success is explained to the participation and continuous contact of these teams: Egypt, Jordan, and the United Arab Emirates , which made the gold harvest predominant in most of these participations.

As for referring to Table (2) of the competitions globally, it is understood that the strategic transformation of the Iraqi team from the Arab competition to competition and focus regionally and face international players and achievements in table tennis.

This can be understood through several indicators, namely the Iraqi team's ability to win a gold medal in all its participations with Asian schools in Taiwan and Korea and the Games in Hanshua.

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Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

This Asian achievement explains that the Iraqi team has moved from honorary participation to the stage of "I am here" to participate, and achieve the achievement, as the three-time international team is not an easy thing and reflects high efficiency in mental and skill preparation to face the continent's champions.

As for 2024, the year of the most quantitative and qualitative participations, as Nigeria's competitions recorded an unprecedented leap of seven gold medals and six bronze medals.

Hence, the importance of the results in Europe appears, as while the result of the medal was one silver in 2024 in Slovenia, the Iraqi team returned with a better result in this country in 2025 to rise to a higher level, which is the level of gold, and this confirms that the Iraqi team succeeded technically in preparing training programs and snatched the winning gold the following year.

The results of the achievements in the World Youth Championship in Slovenia 2024, which was represented in obtaining a gold medal and four silver medals, formed a strategic support to ensure the permanence of Iraqi excellence in international forums, and this achievement is presented as a technical indication of the success of the preparation programs in building a solid base capable of achievement at the highest levels, and at the same time, the ability to snatch silver The championship in China and Montenegro's gold medal in 2025 reflect a high degree of flexibility in the distribution of technical and physical effort across a competitive geography far apart and in close periods of time. This upward pattern practically embodies the concept of survival management at the top of the competitive pyramid as players have managed to maintain their competitive readiness for a long time.

When the nine findings in the global table are analysed, it is clear that the Iraqi presence has gone beyond the qualitative constraints of the areas of competition, with qualitative achievements distributed among East Asia, Africa, and Central Europe. The number of Gold Medals (13 Gold Medals in the Global Table) is a statistical indicator of the efficiency of the strategy and training methods that prioritize the quality of performance and the ability to resolve final disputes.

From the above in tables (1) and (2), it is worth noting that the most results are through the champion player and the great achievement of Iraq 2024 Paris Paralympic gold is the player Najla Imad, as it is mentioned (Fayyad, 2024) that the champion Najla Imad at the beginning of her career in the sport of table tennis, those close to her warned her that the disability will exhaust her and frustrate her hopes, but this young Iraqi woman who survived the explosion that deprived her of her legs and arm insisted on pursuing her ambition and now hopes to win a gold medal, especially after qualifying for the Paralympic Games in Paris.

She did not stop at these participations or compete in local championships, she participated in the Paralympic Games in Tokyo at the age of 16, where she competed in her first participation with Russian Maliak Alieva, and lost in the first match (1-3), then

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

faced Korea's Lee Konwoo, and also lost to her with the same result (1-3), but this increased her strength and determination to challenge to compete in other tournaments.

In 2016, she finished third in the Jordan Championship and participated in the Asian Championship in the UAE in 2017, the Thailand International Championships in 2018, and the 2019 Championships in Egypt. She participated twice and won first and second place, as well as participation in Jordan and Poland, in China she won first place, and in Spain in 2020 she won first place.

It is worth mentioning that after her participation in the Thailand International Championship in 2018 (handicap category) and obtaining the third place, the president of the Table Tennis Federation for the Paralympics, Samir Al-Kurdi, decided to turn her into playing standing and with prosthetics.

Referring to Table (3), which appears in the results of the 2021 tournament held in Tokyo, in which the Iraqi team players qualified, which is considered the stage of consolidating the foot for this stage of competitions technically by reaching the quarter-finals through the player Najla Imad, which was the cornerstone on which the subsequent results were built.(Al Jazeera Net, 2022) indicates that the athlete Najla Imad participated in the Paralympic Games in Tokyo, which took place in the summer of 2021 after a short preparatory period that did not exceed 40 days in Baghdad, and she was the only qualifier from Iraq and the youngest participant.In her first participation, Najla faced female players who were invincible to her experience and age, as she met in her first participation with Russian Alieva Maliak, who plays under the flag of the Russian Paralympic Committee. After her defeat in this first match, Najla continued her journey to face Korea's Lee Kono, but she was not lucky, although her participation in itself was a victory for her and the Iraqis.

In the 2024 Paris Olympics, the performance moved from the stage of competition to the stage of achievement and excellence, as Iraq was officially crowned with the gold in table tennis with absolute sovereignty

When comparing the 2021-2024 edition, we find that the superiority was not born of chance, but rather the result of the accumulation of experiences that started from the quarter-finals of 2021 and ended with the gold in 2024. This result indicates the superiority of the technical staff in addressing the previous skill lapses and turning them into strengths that enabled the player to climb the Paralympic podium for the first time in the history of the game.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Conclusions

1.Iraqi table tennis has achieved an achievement and a historic leap, from qualifying from the quarter-finals in 2021 to the gold medal and dominating the throne of the game in Paris 2024, which confirms the efficiency of the training programs of the coaching staff in technical, psychological and tactical preparation, and winning and deciding the result.

2- Psychological toughness is the decisive factor that the players were able to turn the helm of harsh physical challenges into a motivation to win, which was clearly embodied in the ability of the champion Najla Emad to climb the world and Paralympic gold podiums.

Recommendations

1- The necessity of adopting psychological sports counseling programs as a permanent main pillar in the camps of the national teams, as it is the likely factor to maintain skill stability under the pressure of international competitions.

2- Providing material and technical support for equipment and prosthetic sports limbs and developing sports talents to ensure the continuation of achievement

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The Effect of the Hot Chair Strategy on Developing Cognitive Achievement in the Law of Volleyball among Female Students

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Abstract

The Hot Chair strategy is considered one of the cooperative learning strategies that relies on interactive dialogue and discussion among students to enhance cognitive understanding. This study aimed to identify the effect of the Hot Chair strategy on developing cognitive achievement in volleyball rules among female students. The study adopted a quasi-experimental approach using a two-group design (experimental and control) with pre-tests and post-tests. The study sample consisted of 60 female students from the College of Physical Education and Sports Sciences at the University of Baghdad during the 2025–2026 academic year. The experimental group included 30 students who were taught using the Hot Chair strategy, while the control group consisted of 30 students who were taught using the traditional discussion method. To measure cognitive achievement, a Cognitive Achievement Test for Volleyball Rules was developed. The test was a multiple-choice exam consisting of 20 items covering key topics related to volleyball rules. The test items were designed according to the curriculum content and relevant scientific references to ensure their suitability and validity. The results showed statistically significant differences between the experimental and control groups in favor of the experimental group. These findings indicate the effectiveness of the Hot Chair strategy in improving students' cognitive achievement in volleyball rules. The strategy provides an interactive learning environment based on dialogue, discussion, and active participation, which helps students better understand and comprehend the legal concepts of the game. Accordingly, the study recommends adopting the Hot Chair strategy in teaching volleyball rules in colleges of physical education and sports sciences and encouraging the use of active learning strategies in teaching different sports subjects.

Keywords: Hot Chair Strategy, Cognitive Achievement, Volleyball Rules.

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Introduction and Significance of the Research:

Physical education faces several challenges related to teaching methods and the effectiveness of female students' acquisition of legal knowledge related to the game, especially in light of emergency circumstances such as the COVID-19 pandemic, which has affected traditional teaching methods. From this perspective, the Hot Chair Strategy (Al-Saeedi & Aziz, 2018) is an effective approach to collaborative learning, as it provides an interactive learning environment based on dialogue and discussion among students, which contributes to the development of their knowledge of volleyball rules. Knowledge acquisition of the rules refers to the possession of accurate knowledge related to the rules governing the game under study, which makes the selection of appropriate teaching strategies extremely influential in the success of the teaching and learning process in physical education.

In addition, the hot chair strategy aligns with the three motivational components identified by (Keller, 2010) namely: attention, relevance, and confidence and satisfaction. The exploratory sequential model has highlighted the importance of providing relevant educational materials to increase students' cognitive, psychomotor (skills), and affective abilities. This educational approach is also one of the active learning strategies that enhance the role of the learner in the educational process, as this strategy aims to actively engage the learner in the learning process, focusing on their positive role and continuous activity. "Saad Zayer" (2014) referred to the hot chair strategy as a method used to stimulate students' thinking when discussing a topic from multiple perspectives and listening to different points of view. The teacher acts as a facilitator for the students by selecting students to carry out the discussion task and ensure its success, dividing them into groups, and asking questions to stimulate their thinking or guide them. This strategy has been proven to enhance participants' knowledge of volleyball rules. The content of physical education curriculum documents indicates that rules, terminology, and techniques (skills) represent basic knowledge related to volleyball that must be covered in teaching, which is consistent with research findings (Liya Sakarina Sari, 2013; Yudhianto, 2013; Moh. Latar, 2015). Before the course began, the students were unable to provide correct answers about the objectives of volleyball terms such as "served" or "spike," which are the most commonly used techniques in the game. The students also faced difficulties with additional concepts, such as the definition of volleyball, the objectives of serving, the definition of the concept of interest, and the definition of faults and their legal substance. The researcher believes that cognitive achievement is a fundamental pillar of the educational process, as it plays a pivotal role in enabling students to achieve a deeper understanding of the subject matter. It contributes to the development of critical and creative thinking skills, which gives students the ability to analyze information and make informed decisions based on knowledge. Cognitive achievement also enhances students' ability to solve problems in a creative and effective manner, whichThis has a positive impact on their academic and practical performance. Knowledge acquisition also encourages self-learning and

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Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

continuous research, fostering in students a lifelong passion for acquiring knowledge in a sustainable manner.

Preliminary (exploratory) observations revealed a wide gap between the students' current knowledge and the expected level of proficiency. This gap prompted an investigation into the effect of the hot chair strategy on students' knowledge acquisition of volleyball rules. Therefore, there is an urgent need to use modern teaching strategies aimed at enhancing student participation in the learning process in an effective manner ( ), especially since third-year students often lack sufficient accumulated knowledge or practical experience. Considering the reality of teaching volleyball in physical education and sports science colleges, we find that it is dominated by a passive approach to receiving information by students, which contradicts modern trends based on constructivist theory in education, which emphasizes the importance of the active role of learners in educational situations. Based on this, the research problem was formulated to clarify the answers to the following questions:

- To what extent does the hot chair strategy affect female students' cognitive achievement in volleyball rules?
- Does the hot chair strategy have a significant (statistically significant) effect on the cognitive achievement of volleyball rules?

Research methodology and field procedures:

The research adopted a quasi-experimental approach due to its suitability for the nature of the problem, with the design of two equivalent groups (experimental and control) with pre- and post-tests for both groups.

Research community and sample: The research community was defined as third-year students at the College of Physical Education and Sports Sciences, University of Baghdad, for the academic year 2025/2026, numbering (549) students. The main research sample was selected by drawing lots from among the third-year female students, with a sample size of (60) students. The sample was randomly divided into two equal groups:

- The experimental group: consisted of (30) female students (Division A) and underwent educational units according to the hot chair strategy.
- Control group: consisted of (30) female students (Division B) and underwent educational units according to the traditional method.

Table1. Distribution of research sample individuals according to groups and teaching method

Group	Section	Number of students	Teaching method used
Experimental	A	30	Hot chair strategy
Controlled	B	30	Method used (traditional)
Total		60	

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Research Instruments

Application of the Hot Chair Strategy:

The researcher relied on the Hot Chair Strategy as one of the Active Learning Strategies that focuses on classroom interaction, critical thinking development, and knowledge building through structured dialogue and role-sharing among learners. This strategy is based on the principle of placing the learner in a stimulating educational situation that requires them to recall, analyze, and apply information in the context of direct questions, thereby promoting a deep understanding of the educational content (Prince, 2004; Bonwell & Eison, 2011; Alghamdi & Al-Salouli, 2020).

The strategy was applied during the educational units on volleyball rules, where a chair in the classroom known as the "hot chair" was reserved for one of the students to sit on after the lesson content had been presented. Before the discussion session began, the researcher set clear educational objectives related to the cognitive aspects of the rules, such as technical errors, refereeing situations, scoring mechanisms, and special playing situations. After that, the rest of the students ask direct oral questions to the student sitting on the hot chair, so that the questions are related to the lesson content and formulated in a way that requires understanding and interpretation, not just memorization and recall (Silberman, 2014; Sakarina Sari, 2019).During the activity, the researcher acts as the organizer and facilitator of the discussion, controlling the time of the session, directing questions when necessary, and providing corrective feedback in case of misconceptions, without directly interfering in the answering process, thus maintaining the active nature of learning. The principle of role rotation among students was also adopted, so that all members of the group participated in sitting on the hot chair during the various educational units, which contributes to achieving educational justice and increasing learning motivation (Johnson, Johnson, & Smith, 2014; Zayapragassarazan & Kumar, 2019).

This mechanism was consistent with the nature of learning the rules of sports, especially volleyball, which requires a precise understanding of changing refereeing situations and linking theoretical rules to practical application on the court. The hot chair strategy also contributed to enhancing classroom interaction, developing communication skills, and raising the level of cognitive achievement among students, which is confirmed by recent studies on active learning (Hattie, 2012; Alghamdi & Al-Salouli, 2020).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Cognitive achievement test:

The volleyball knowledge test consists of (20) multiple-choice test questions developed based on volleyball lesson plan standards. To ensure the comprehensiveness of the test, a Table of Specifications was constructed, through which the items were distributed across the first three cognitive levels (remembering, understanding, applying), with the remembering level comprising six questions (30%), the understanding level comprising seven questions (35%), and the applying level comprising seven questions (35%).

The test and its specifications table were presented to a group of experts (Expert Judgment) in teaching methods and volleyball to determine the appropriateness of the questions and their wording, and to review various sources to ensure that the questions were related to the subject matter. Since this research was conducted before the main study, the validity of the test was determined using the Validation Expert Method.

An indicator-referential rubric was also used to assess the quality of the educational process, and the researcher was the observer himself. The rubric received an expert validity score of 90%. The internal reliability of the test was estimated using the Kuder-Richardson equation, and the analysis resulted in a reliability coefficient of (0.71), which is classified as highly reliable and educationally acceptable (Moh. Latar, 2015; Liya Sakarina Sari, 2013).

Table 2. shows the specifications of the cognitive achievement test for volleyball rules distributed according to cognitive levels

Cognitive level	Number of items in the test	Number of paragraphs	Relative weight (%)
Knowledge	1, 4, 7, 10, 13, 16	6	30%
Comprehension	2, 5, 8, 11, 14, 17, 19	7	35%
Application	3, 6, 9, 12, 15, 18, 20	7	35%
Total	-	20 Paragraph	100%

Exploratory study:

The researcher conducted a preliminary study on 20/11/2025 on a sample of (30) female students in the third stage at the College of Physical Education and Sports Sciences, University of Baghdad. Five students were excluded for failing to attend, bringing the final sample size to (25) students, who were excluded from the main study sample. The experiment aimed to ensure the clarity of the instructions and verify the psychometric properties of the test.

The exploratory experiment aimed to determine the effect of the hot chair strategy on the cognitive achievement of volleyball rules among female students at the College of Physical Education and Sports Sciences, University of Baghdad. The participants were randomly divided into two groups; the experimental group was treated using the hot chair strategy, while the control group was treated using the traditional method. The treatment

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

was provided in only two sessions. Data were collected by applying a test of knowledge of volleyball rules before and after treatment.

The data were analyzed using an independent t-test to compare the means of the experimental and control groups. Given the equal size of the two groups (30 students per group) and the similarity of the variance, the t-test was used assuming equal variance, with a degree of freedom of 58.

Psychometric characteristics

Test validity: The researcher relied on two types:

- Apparent validity: by consulting a committee of experts in physical education and sports science at the University of Baghdad to approve the test items.
- Internal consistency validity: The researcher calculated the Pearson correlation coefficient between the score for each item and the total test score based on the exploratory sample of (25) female students. The results showed statistically significant correlations, indicating that the test is valid for measurement.
- Reliability: The researcher verified the reliability of the cognitive achievement test using the retest method. The test was administered to the sample (25 students) and re-administered after a seven-day interval. Pearson's correlation coefficient was calculated between the results of the first and second administrations. The value obtained indicated a high level of reliability/stability.

Item analysis (difficulty and discrimination):

Based on the responses of the (10) participants, an item analysis was conducted to ensure the quality of the test questions:

- **Difficulty coefficient**: This was calculated to determine the percentage of correct answers. The coefficients ranged within acceptable limits (usually 0.20–0.80), indicating that the items were neither too easy nor too difficult.
- **Discrimination coefficient**: The sample was divided into two groups (upper and lower). The discrimination coefficient was calculated to measure each item's ability to differentiate between proficient and non-proficient students. The values were within the recommended range (≥ 0.30), justifying the retention of the items.
- Normality of distribution To ensure that the data were suitable for parametric statistics, the researcher verified the normality of distribution of the exploratory sample (10 students). The skewness coefficient for the total scores was calculated. The result was limited to (+-1), indicating that the data followed a normal distribution curve (Gaussian curve), which justified the use of parametric tests in the main study.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table 3. Normal distribution

Arithmetic mean	Median	Standard deviation	Coefficient of skewness	Coefficient of skewness
12.45	13.00	2.15	-0.24	0.55

Table (3) shows that the skewness coefficient is (-0.24), which falls within the range (+-1). This indicates that the data is free from extreme skewness and follows a normal distribution, justifying the use of parametric statistics.

Table 4. Psychometric properties of the volleyball knowledge achievement test

Psychometric Property	Value	(Sig)
Validity	*0.88 – 0.45	0.00
Reliability	0.87	0.00
Objectivity	0.99	0.00

Honesty: All items showed statistically significant correlations with the total score, ranging from (0.45) to (0.88).

Consistency: The correlation between the first and second applications was (0.87), indicating high consistency.

Objectivity: The correlation between two independent raters was (0.99), indicating that the test results are not affected by the rater's judgment (especially since it is a multiple-choice test).

Table 5.shows the difficulty and discrimination coefficients

T	Correct Answers (High Group n=8)	Correct Answers (Low Group n=8)	Difficulty coefficient	Discrimination coefficient
1	7	2	0.56	0.63
2	8	3	0.69	0.63
3	6	1	0.44	0.63
4	5	2	0.44	0.38
5	8	4	0.75	0.50

The difficulty coefficients ranged between (0.25 – 0.75) with an average of (0.52), which means that the test is of medium difficulty. The discrimination coefficients ranged between (0.38 – 0.75), and all values were higher than (0.30). This confirms that all items are capable of distinguishing between outstanding and non-outstanding students.

Main experiment:

The main experiment was conducted on 11/27/2025, where the strategic atmosphere was designed to create an environment in which students feel safe and comfortable asking questions to their peers. The students sat in a semicircle, facing the student sitting on the "hot chair," which was placed at the front of the lecture hall facing the blackboard. The instructor has a set of questions that have been previously taught and re-explained to these students, which the students will ask each other during breaks or during the theoretical lesson on volleyball rules. The instructor walks around the classroom, listens to the questions, and provides corrections as needed.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The results indicated that the hot chair strategy could be deployed in physical education lessons to help meet educational standards. More importantly, the use of this questioning strategy in physical education lessons has the potential to increase cognitive knowledge of rules when used across a variety of sports. The hot chair strategy has shown promise in increasing knowledge acquisition among early childhood education students. McCarty and McCarthy (C. D. McCarty & S. A. McCarthy) also suggested that the strategy could increase peer interaction and questioning among secondary education students. The hypothesis assumes that the hot chair strategy can also be useful when integrated into physical education lessons that set standards for content knowledge and analysis.

Group (experimental):

Interacted with the educational content presented according to the hot chair strategy. The group members sat in a circle facing inward. The students sitting in the "hot chair" were expected to answer the questions prepared by the instructor correctly and to either write or prepare an additional question that involved thinking at a cognitive level for the next group member. Their willingness to sit in the hot chair and the number of correct answers they gave were considered indicators of their cognitive achievement in volleyball rules. The students responded to the questions posed by the teacher by writing the answer on a "question and answer" card, mentioning the name of the topic that fits the rule, and then returning the card. The strategy also ensured active cooperation during the class discussion to clarify the rules, both on and off the hot chair.

The control group:

received the same content but learned according to the traditional curriculum. Participants were encouraged to apply group discussion outside of class as preparation with the same expectations as the hot chair.

The research procedures were as follows: Before treatment, both groups underwent a (pre) test. After that, the experimental group received treatment using the hot chair strategy, while the control group received treatment using the traditional method. After the treatment, both groups underwent a post-test.

Presentation and analysis of results

The data were statistically analyzed to identify the effect of the hot chair strategy on the research sample's cognitive achievement of volleyball rules. The analysis included a sample of (60) female students, divided equally into (30) students in the experimental group and (30) students in the control group.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Table6. Arithmetic means, standard deviations, and t-test values for the cognitive achievement scores of volleyball rules for the experimental and control groups in the pre- and post-tests

Test	Group	Arithmetic mean	Standard deviation	t-value Calculated	Value (t) Table	Significance Statistical
Pre-	Experimental Controlling	68.30 65.71	7.407 8,065	1.285	2.028	Non-material
Post-trial	Experimental Controlling	87.30 72.12	6.086 8.066	8.237	2.028	Moral

*At a significance level of (0.05).

Descriptive statistics for the experimental group in the pre-test showed that the mean cognitive skill score was (68.30) with a standard deviation of (7.407). The control group obtained a mean score of (65.71) with a standard deviation of (8.065). In the post-test, the experimental group achieved an average score of (87.30) with a standard deviation of (6.086), while the control group obtained an average of (72.12) with a standard deviation of (8.066).

The t-test for independent samples showed that the t-value calculated in the pre-test was (1.285), which is less than the tabulated value of (2.028) at a significance level of (0.05), indicating that there were no statistically significant differences between the mean scores of the experimental and control groups. This indicates that the two groups were equivalent before the start of the experiment, which reinforces the internal validity of the experimental design and confirms that the post-test differences are attributable to the effect of the independent variable, which is the hot chair strategy.

In the post-test, the calculated t-value was (8.237), which is greater than the table value of (2.028), indicating statistically significant differences in favor of the experimental group. This is attributed to the effect of the hot chair strategy on the development of cognitive achievement.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Pre- and post-test results:

The results of the statistical analysis using the independent samples t-test showed the following:

- **In the pre-test:** No statistically significant differences were found between the mean scores of the experimental group and the control group, as the calculated t-values were non-significant, confirming the equivalence of the two groups before the start of the experiment.
- **In the post-test:** The experimental group (which studied using the hot chair strategy) outperformed the control group by a significant margin. The arithmetic mean of the experimental group's scores increased significantly compared to the arithmetic mean of the control group.

Discussion of results:

This strategy contributed to raising the level of knowledge acquisition among students, as it provided a safe and stimulating learning environment that encouraged students to ask questions and engage in in-depth discussion of the law, unlike the traditional method, which often relies on rote learning.

Pre-test results:

The mean score for the pre-test of the experimental group was (61.3).
The mean score of the pre-test for the control group was (61.3). Thus, the pre-test scores for both groups had the same mean of (61.3).

Post-test Results:

After conducting the post-test for the experimental group, the arithmetic mean of the post-test for the experimental group was (75.8).
The post-test scores for the control group had a mean of (64.7).

Discussion of Differences and Conclusion:

The mean scores of the experimental group increased from (61.3) to (75.8), while the mean scores of the control group increased from (61.3) to (64.7), with different teaching methods in the two groups. Based on the data obtained, the calculated t-count value was determined to be 6.69, while the critical/tabular t-value at a significance level of (0.05) was found to be (2.00). Data analysis shows that there is a significant (statistically significant) effect of the hot chair strategy on the cognitive aspect of volleyball rules (Wibisono et al., 2018).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Conclusions:

The results confirmed that the hot chair strategy had a positive and significant (statistically significant) effect on improving the cognitive achievement of volleyball rules in the research sample (Astia, 2015). The average scores of the experimental group (1), which learned volleyball rules using the hot chair strategy, was higher than that of the control group, which learned the rules using the cooperative learning method. Thus, the initial hypothesis, which stated that the hot chair strategy had a positive effect on the students' cognitive achievement of volleyball rules, was accepted.

The hot chair strategy used in this experiment succeeded in creating a fun and relaxed atmosphere, which supported the students' psychology and had a positive effect on their cognitive achievement of the rules. The variation in the teaching method used in this experiment, which differs from traditional methods, enabled the students to better acquire volleyball rules as their main cognitive achievement (Wibisono et al., 2018).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Recommendations:

The following recommendations are made with the aim of improving students' knowledge acquisition of volleyball rules through the hot chair strategy:

Additional studies could be conducted to verify the improvement of volleyball skills and cognitive rule acquisition in other sports.

Research samples could be expanded to include participants from groups with high and low academic levels, or by conducting a cross-age study, or by using groups of teachers and female students from the same high schools.

The same experiment can be repeated using other cooperative learning methods, such as the Teammates-a-Team strategy and the Numbered Heads Together strategy.

It may also be useful to conduct the research in different contexts, such as physical education courses that cover other sports, such as badminton, basketball, or soccer.

Other cognitive exercises could be devised to help students understand the basic rules of volleyball.

Journal of Physical Education
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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The Effect of Repeated Speed Exercises on Anaerobic Functional Variables, Explosive Leg Power, and Individual Defensive Movement in Handball

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Abstract

The importance of this research lies in highlighting one of the modern training methods that may contribute to improving the athletic performance of handball players, whether on the physical or tactical level. From the perspective of physiological variables, repeated-sprint training at maximal and sub-maximal intensities is employed to enhance anaerobic capacity and increase the efficiency of the nervous system. The research problem emerged from the observation that many coaches focus heavily on offensive skills, neglecting the fact that an offensive mistake results in losing the ball, whereas a defensive error grants the opponent a scoring opportunity. Additionally, poor performance results may be attributed to the inability of the body's functional systems to withstand the demands of continuous and variable motor performance, as well as the noticeable delay in physical preparatory aspects such as speed of movement across the court, reaction time, and decision-making during defensive situations like intercepting or clearing the ball. Despite the importance of these aspects, training programs for players under 15 years of age still require further development in defensive performance and movement speed, which in turn influence physical abilities such as lower-limb explosive power and anaerobic functional variables.The study aims to: Design repeated-sprint training using maximal and sub-maximal intensities for handball players under 15 years of age, and identify the effects of this training on the alactic (phosphagen) anaerobic functional variable, lower-limb explosive power, and individual defensive movement among players in this age group. The researchers used the experimental method with a design of two equivalent groups (experimental and control). The research population consisted of players from the Specialized Handball School in Baghdad under the age of 15. The sample was intentionally selected and consisted of (20) players, randomly divided into two groups: (10) players in

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the experimental group and (10) in the control group. Results showed that repeated-sprint training had a significant positive effect on the development of lower-limb explosive power (right and left) and on improving the phosphagen anaerobic functional variable in the experimental group. The designed training also led to significant improvement in individual defensive movements, including ball interception and clearance. A lesser degree of improvement was observed in the control group compared to the experimental group.

Keywords: repeated speed, anaerobic functional variables, explosive power, individual defensive movement.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Introduction

Handball is considered one of the team sports that requires a high level of physical performance characterized by a variety of rapid movements, sudden changes of direction, and repeated short sprints, particularly in defensive areas. Speed of transition, power of performance, speed endurance, and anaerobic capacity are major determinants of defensive success, which makes the physical and functional demands placed on the player complex and multifaceted.

Repeated Sprint Training (RST) is regarded as one of the modern training methods that combines short, high-intensity sprints with relatively short recovery periods. It focuses on improving players' anaerobic performance, increasing explosive and rapid leg power, and enhancing motor efficiency in individual defensive movements, thereby creating a training environment that closely resembles match conditions. Bishop, Girard, and Mendez-Villanueva (2011) defined repeated sprint ability (RSA) as the athlete's ability to perform a series of maximal and submaximal short sprints interspersed with short or incomplete recovery periods, while maintaining the highest possible performance in each repetition. The effectiveness of repeated sprint training lies in improving anaerobic performance and the ability to repeatedly sustain high-intensity efforts, a concept that is particularly important in sports that rely on repeated high-intensity actions such as handball, football, rugby, and others.

In light of recent developments in sports training methodologies, there has been a growing need to design specialized training programs that enhance the anaerobic functional capacities of handball players, improve recovery ability, and develop explosive and defensive power, which are considered fundamental elements in confronting fast offensive actions by opponents. Haddad (2013) and Machado (2007) indicated that both sports scientists and coaches agree that the ability to perform repeated sprints with short recovery intervals—known as repeated sprint ability—is an essential characteristic in various sports competitions and represents one of the basic components of physical fitness aimed at improving performance in activities that require repeated speed actions.

Despite the widespread use of such training methods in sports such as football and athletics, their effects within the context of handball, particularly on individual defensive performance, still require further investigation. Moreover, outstanding performance in handball is not limited to physical and skill-related aspects alone; it also extends to the functional aspects of the player, which reflect the efficiency of the body's systems in meeting physical workload demands and adapting to the variables that occur during the match and the motor tasks assigned to players, enabling the body to sustain performance throughout the entire duration of the game.

Al-Saqqa (2010: 91) stated that the playing rhythm in handball consists of rapid and short bouts of movement performed by the player to execute game tasks during offense or defense, with or without the ball. Although handball is predominantly an anaerobic endurance sport, the continuation of match duration for 60 minutes or more requires a certain level of aerobic endurance. The researchers believe that individual defensive movements represent a fundamental pillar of the team's defensive system and require the player to possess rapid response ability and effective maneuvering skills to repel opponents' attacks and prevent them from obtaining favorable shooting positions. This was

Journal of Physical Education
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https://jcope.uobaghdad.edu.iq

supported by Kazem and Haddad (2021: 22), who emphasized that the development of physical abilities—especially those combining strength and speed—is essential for sports that require overcoming resistance and rapid transitions and movements. Such development is achieved through combined and varied exercises, in addition to jumping and lateral movements, which enhance muscular strength in the working muscle groups at intensities greater than those to which the players are accustomed. This, in turn, stimulates the working muscles and improves performance by increasing pushing force laterally and forward, while intramuscular and intermuscular coordination contributes to increasing movement speed.

Based on the above, the importance of this study lies in highlighting one of the modern training methods that may contribute to the development of handball players' athletic performance, both physically and tactically. From a functional perspective, repeated sprint exercises at maximal and submaximal intensities contribute to enhancing anaerobic capacity, increasing neuromuscular efficiency, and improving the body's ability to remove lactic acid, which positively reflects on players' performance during matches that may extend to extra periods.

The research problem emerged from observing the considerable attention given by coaches to developing offensive skills, while neglecting the fact that an error in offense leads to loss of possession, whereas an error in defense grants the opponent a direct goal. Poor defensive results may also be attributed to the inability of the body's functional systems to tolerate variable and continuous motor performance during the match, in addition to deficiencies in physical preparation, such as transition speed on the court, reaction speed, and decision-making when intercepting or deflecting the ball. Accordingly, there is a clear need for training programs that focus on developing defensive performance and the physical and functional capacities that support it, such as explosive leg power and anaerobic efficiency.

From this perspective, the research problem is formulated in the following question: Do repeated speed exercises have an effect on explosive power, anaerobic functional capacity, and individual defensive movement in handball players under 15 years of age?

1.2 Research Objectives

1. To design repeated speed exercises at maximal and submaximal intensities for handball players under 15 years of age.
2. To identify the effect of repeated speed exercises on anaerobic functional variables (phosphagen system), explosive leg power, and individual defensive movement in handball players under 15 years of age.

1.3 Research Hypotheses

1. There are no statistically significant differences between the pre- and post-test results of the control and experimental groups in the anaerobic functional variable (phosphagen system), explosive leg power, and defensive movement of handball players under 15 years of age.
2. There are no statistically significant differences in the post-test results between the control and experimental groups in the anaerobic functional variable (phosphagen system), explosive leg power, and defensive movement of handball players under 15 years of age.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

1.4 Research Scope

1. **Human scope:** Players of the National Center for Sports Talent Care in handball under 15 years of age, totaling 20 players, for the 2024–2025 sports season.
2. **Time scope:** From 12/10/2024 to 5/5/2025.
3. **Spatial scope:** The National Center for Sports Talent Care in Handball, Ministry of Youth and Sports, Al-Rusafa, Baghdad.

2. Methods and Procedures

2.1 Research Design

The researchers employed the experimental method using a two equivalent-group design (experimental and control groups) with pre- and post-tests. This design was selected as it is appropriate to the nature of the research problem and suitable for achieving the study objectives.

2.2 Research Population and Sample

The research population consisted of handball players from the Specialized Handball School in Baghdad under 15 years of age. The research sample was selected intentionally and initially included 30 players registered in the Iraqi Handball Federation records and regularly participating in training and competition. Five players were excluded because they were goalkeepers due to the differences in their training programs, and another five players were excluded based on recommendations from the coaching staff at the center because of frequent absences from training and the presence of injuries. Accordingly, the final sample comprised 20 players, who were randomly assigned into two groups: 10 players in the experimental group and 10 players in the control group. The sample represented 66.66% of the total population.

To avoid the influence of individual differences on the experimental results, homogeneity among the sample participants was established for the variables of body mass, height, chronological age, training age, and body mass index. These characteristics are presented in Table (1).

Table1. *Statistical characteristics of the variables (chronological age, training age, total body height, and body mass)*

Variable	Unit	Mean	Standard Deviation	Median	Skewness
Chronological age	year	14.86	0.64	14	−0.50
Training age	year	2.22	1.55	2	0.54
Total body height	cm	162.67	4.84	161	0.32
Body mass	kg	50.15	4.82	40	0.17

As shown in Table (1), the skewness values ranged within ±1, indicating a clear homogeneity in these variables among the members of the research sample.

2.3 Instruments, Tools, and Means of Data Collection

- Arabic and foreign references and sources.
- Internet resources.
- Tests and measurements.
- Questionnaire forms related to functional variables, explosive power, and individual defensive movements.
- Adhesive tape and a 50 m metallic measuring tape (1).

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

- Training ladders and elastic resistance bands of various lengths.
- Cones of different heights (10).
- Hurdles with a height of 30 cm (10).
- Platform with a height of 40 cm (1).
- Laptop computer (HP) (1).
- Medical scale for measuring body mass and a metallic measuring tape for height.
- Numbered board to identify the player number and the performed trial.

2.4 Description of the Tests for Functional and Physical Variables and Individual Defensive Movements in Handball

First: Explosive Leg Power

Test name: Triple hop test for the right and left legs (Al-Badri & Al-Sudani, 2011).
Purpose: To measure speed–strength (explosive power) of the right and left legs.
Equipment: Flat surface, measuring tape, whistle.
Performance description: The participant stands at the starting line on one leg (the leg used for hopping) and performs three consecutive hops, aiming to cover the maximum possible distance.
Conditions:

- The take-off must be performed from a stationary position.
- The performance should be executed as quickly as possible.
- Measurements are recorded to the nearest centimeter.
- Two trials are allowed for each leg, and the best attempt is recorded. **Scoring:** The score is the distance (to the nearest centimeter) measured from the starting line to the point reached after the third hop.

Second: Phosphagen Anaerobic Capacity Test *(Radwan, 1998, p. 162)*
Test name: Step Test (10 s)
Purpose: To measure phosphagen anaerobic capacity.
Equipment: Step box (40 cm height), stopwatch, body-weight scale, whistle.
Performance description:

The participant (player) stands in front of a step box with a height of 40 cm, placing one foot on the box and the other on the ground, with body weight initially supported by the free leg (on the ground), while the other leg is placed on the box. At the start of the test, the participant lifts the body upward by stepping onto the box. In all cases, the free leg remains extended, and the trunk is kept upright; the free leg assists in upward propulsion. The arms are used only to maintain balance during the test and must not contribute to propulsion through swinging. The movement rhythm follows two counts (one–two): "one" for stepping up and "two" for stepping down.

Scoring:

The total number of steps is recorded (upward and downward). A step is counted when the participant stands up straight on top of the box with the free foot away from the box. The duration of the test is 10 s.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Calculation of phosphagen anaerobic capacity:

$$\text{Phosphagen power} = 1.33 \times \frac{\text{Body mass (kg)} \times 0.4\,\text{m} \times \text{Number of steps in } 10\,\text{s}}{10\,\text{s}}$$

Third: Individual Defensive Movement Test in Handball

Test name: Intercepting and deflecting the ball among three attacking players in handball *(Hamel, Saad, 2020, p. 6)*

Purpose: To measure a defender's ability to intercept and deflect the ball among three attacking players.

Equipment: Whistle, stopwatch, measuring tape, colored adhesive tape, half a handball court, four handballs, three attacking players.

Test setup and performance:

An equilateral triangle is centered at the midpoint of each side of which is also 4 m long, with the apex being at the mid-point between two points on a line that's 7 m long and the base just barely overhanging in to a box that's 9 by 18 m.

- Each attacking player stands at one vertex of the triangle; one player holds the ball before the start signal.
- Balls are distributed equally among the attackers and placed near each of them.
- A circular mark with a diameter of 1 m is drawn at the center of the triangle, where the defender stands.
- After the referee's whistle, the attackers begin passing the ball quickly among themselves for 30 seconds, while the defender moves to seize suitable opportunities to intercept or deflect the ball.

Test conditions:

- Attackers are instructed to use overhead passes only.
- The referee positions himself at a distance that allows clear observation without interfering with performance.
- When the defender successfully intercepts or deflects the ball, the referee stops the time until play resumes; this procedure continues until the allotted time expires.
- A successful attempt is not counted if the defender does not initiate movement from the marked circle (at least one foot must be in contact with the circle).
- In the event of errors or interruptions (e.g., cramps, sprains, external interference), the participant performs the next attempt after confirming readiness. If the error recurs, the participant is not tested on that day and is preferably retested on another day.
- The attacking passers remain the same until all participants complete the test.
- Each participant is given two attempts; each attempt lasts 30 seconds, and the better attempt is recorded.

Scoring method:

The total number of successfully intercepted and deflected balls is counted for each attempt.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2.5 Field Procedures

2.5.1 Pilot Studies

The researchers conducted several pilot studies. The first pilot study was carried out on Monday, 21/10/2024, at 3:30 p.m. in the hall of the National Center for Sports Talent Care in Handball. It involved tests of speed–strength (explosive leg power), phosphagen anaerobic functional capacity, and individual defensive movement, using a sample of three handball players under 15 years of age. The purpose was to verify the players' physical and functional capabilities during test application, identify potential difficulties, determine appropriate solutions compatible with their abilities, estimate the time required for the tests, identify possible obstacles prior to the

main experiment, and confirm the validity of the tools used to measure functional variables.

To determine the required training intensity, a second pilot study was conducted for the exercises used by determining maximal heart rate in the same sample. This study was implemented on Wednesday, 23/10/2024, at 3:30 p.m. Training load components were regulated by administering maximal physical exercises to determine maximal heart rate. These exercises included:

- A 30 m sprint from a standing start.
- A 30 m hopping exercise, divided into 15 m hopping on the right leg and 15 m hopping on the left leg.

To control exercise intensity during training sessions, resting heart rate was measured for each player before maximal exercises and immediately after completion via the carotid artery during the first 6 seconds, with the result multiplied by 10 to obtain beats per minute, as this method is considered the most accurate (Al-Qatt, 1999, p. 43).

In coordination with the coaching staff, the researchers also conducted a pilot training unit involving repeated maximal-intensity speed exercises to achieve the required training intensity, determine exercise duration and repetitions prior to the main experiment. The purposes were to:

- Determine the number of exercises used for each physical and motor ability within a training unit.
- Verify the duration of the training unit.
- Regulate training load components, including maximal repetitions and maximal-intensity exercises, to determine the required intensity.
- Assess players' acceptance and understanding of the exercises and their level of difficulty.

2.6 Main Experiment

2.6.1 Pre-tests

After completing the research procedures and pilot studies, the researchers conducted the pre-tests on the research sample at the hall of the National Center for Sports Talent Care in Handball, Baghdad, at 3:30 p.m. on Monday, 28/10/2024, in the presence of all members of the experimental and control groups, according to the following sequence:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Physical ability tests were administered, including the speed–strength test for the right and left legs, the anaerobic functional variable test represented by the 10 s step test, and the individual defensive movement test (intercepting and deflecting the ball among three attacking players). Adequate rest was provided between tests in the form of turn-waiting rest periods ranging from 10 to 15 minutes, which was sufficient for heart rate to return to its normal warm-up level (110–120 beats/min). This ensured that players were prepared to perform each subsequent test with maximal effort. Test results were recorded by the coach and the assisting team (Appendix 4), with support from the researchers.
The pre-test results were used to establish equivalence between the research groups, as shown in Table (2).

Table2. *Equivalence between the control and experimental groups*

Test	Unit	Control group (Mean ± SD)	Experimental group (Mean ± SD)	t-value	Sig.	Significance
Triple hop (right leg)	m	3.393 ± 0.458	3.284 ± 0.219	0.678	0.50	Not significant
Triple hop (left leg)	m	2.493 ± 0.338	2.394 ± 0.363	0.544	0.43	Not significant
Step test (10 s)	count	53.600 ± 3.717	55.800 ± 3.259	1.407	0.17	Not significant
Interception & deflection test	count	2.600 ± 0.516	2.300 ± 0.483	1.342	0.19	Not significant

2.6.2 Preparation and Implementation of Repeated Speed Exercises

After reviewing the relevant sources and studies in the field of sports training science, the researchers determined the content and principles for designing repeated speed exercises at maximal intensity. These exercises were incorporated into the training program of the experimental group, starting on Saturday, 2/11/2024, and ending on Wednesday, 25/12/2024. The program included the following components:

- The exercises were implemented during the main part of the training session within the prescribed training curriculum of the sample. The program was applied for a duration of **8 weeks**, with **three training sessions per week** on **Saturday, Monday, and Wednesday**, resulting in a total of **24 training sessions**. The total duration of each training session was **120 minutes**, while the main part lasted **90 minutes**. The repeated speed exercises were performed for a period ranging between **25 and 35 minutes** within the main part of the session.
- A variety of training methods were employed within the program and its main section, including **high-intensity interval training** and **repetition training**, with intermittent recovery periods. Training intensity ranged between **80% and 100%** of the player's maximum performance.
- To avoid excessive fatigue, considering that the musculoskeletal system of young players is still in a developmental stage, **high-intensity exercises were kept very short** (e.g., **5–15 seconds of maximal effort**), followed by adequate recovery periods with **work-to-rest ratios of 2:1 or 3:1**. To prevent repeated severe fatigue, the program began with **submaximal intensity** and gradually progressed to **maximal intensity**. The number of repetitions ranged from **3 to 5 repetitions**, with

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

2 sets, and rest intervals between sets were determined according to exercise duration and intensity.

- Training load levels were divided into **moderate, high, and maximal** throughout the duration of the training program.
- Training intensity was determined based on the player's **maximum heart rate**, calculated according to the following equation (Al-Bashtawi & Al-Khawaja, 2005, p. 66):

$$\text{Maximum heart rate} = 220 - \text{age}$$

$$\text{Target heart rate} = \frac{\text{Maximum heart rate} \times \text{Required intensity}}{100}$$

Heart rate is considered one of the most important and easily applicable physiological indicators in practical settings. It allows for the determination of training load intensity and provides coaches with rapid and reliable feedback on the responses of functional systems during training, thereby guiding the regulation of training load (Al-Basati, 1998, p. 44).

Post-tests

After standardizing the conditions related to the pre-tests—such as location, timing, and execution procedures—to ensure consistency, the researchers conducted the post-tests on **Friday, 27/12/2024**, at **3:30 p.m.**, under the same temporal, spatial, and instrumental conditions as those of the pre-tests. All tests applied in the pre-test phase were repeated to ensure accuracy and comparability of the results.

3. Presentation and Discussion of Results

3.1 Presentation and Discussion of the Pre- and Post-Test Results for the Experimental and Control Groups

Table (3) presents the arithmetic means, standard deviations, mean differences and their standard deviations, *t*-values, and significance levels for the pre- and post-test results of all research variables for the **experimental group**.

Table.3. *Means, standard deviations, mean differences, t-values, and significance between pre- and post-tests for all research variables in the experimental group*

Test	Unit	Pre-test Mean	SD	Post-test Mean	SD	Mean diff.	SD diff.	t-value	Sig.	Significance
Triple hop (right leg)	m	2.285	0.219	4.028	0.286	1.743	0.444	10.283	0.01	Significant
Triple hop (left leg)	m	2.934	0.326	3.891	0.980	0.885	0.361	11.111	0.002	Significant
Step test (10 s)	count	55.800	3.259	62.850	5.366	7.050	4.290	5.197	0.00	Significant
Interception & deflection among three attackers	count	2.300	0.483	4.100	0.567	1.800	0.632	9.000	0.00	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Significant when the error level ≤ significance level (0.05).

Table (4) presents the arithmetic means, standard deviations, mean differences and their standard deviations, *t*-values, and significance levels for the pre- and post-test results of all research variables for the **control group**.

Table 4. *Means, standard deviations, mean differences, t-values, and significance between pre- and post-tests for all research variables in the control group*

Test	Unit	Pre-test Mean	SD	Post-test Mean	SD	Mean diff.	SD diff.	t-value	Sig.	Significance
Triple hop (right leg)	m	2.193	0.458	3.263	0.434	1.076	0.753	8.825	0.00	Significant
Triple hop (left leg)	m	2.493	0.338	3.118	0.187	0.625	0.184	7.762	0.01	Significant
Step test (10 s)	count	53.600	3.717	58.1795	6.0124	4.579	4.846	2.988	0.01	Significant
Interception & deflection among three attackers	count	2.600	0.516	3.500	0.527	0.900	0.875	3.250	0.01	Significant

Significant when the error level ≤ significance level (0.05).

Discussion of Results

Based on the results presented in Table (3), a statistically significant improvement was observed in the explosive leg power variable, represented by the triple hop test for the right and left legs, in the experimental group in favor of the post-test. This finding confirms the effective impact of repeated maximal-intensity speed exercises on developing and enhancing the explosive power of the leg muscles. These exercises enabled the players to utilize this power efficiently during repeated forward hopping when performing the test, indicating that the implemented exercises were designed according to sound scientific principles that allowed players to generate maximal force in the shortest possible time.

The researchers intentionally designed the exercises to emphasize repetitions characterized by rapid and powerful muscular contractions in order to increase muscle elasticity and maximize energy utilization to support forward propulsion. The researchers believe that this improvement in speed–strength resulted from the development of the muscle groups involved in performance under intensities greater than those to which the players were previously accustomed, thereby creating a favorable interaction between strength and speed. This is consistent with the findings of Hussein and Naseef (1987, pp. 95–96), who stated that the development of speed–strength occurs through two primary methods: improving muscular strength and increasing the rate of muscular contractions. This indicates enhanced development of the working muscle groups and an increased contraction speed among the experimental group.

Rey (2019, p. 25) also confirmed that performing repeated sprint training twice per week over a period of 7–10 weeks improves sprint performance, acceleration, sprint time, repeated sprint ability, high-intensity running, and change-of-direction performance in sports. In addition, Kazem, Widad, and Hisham (2018, p. 11) emphasized that speed–strength is closely associated with skill performance; the greater the speed–strength possessed by the player, the higher the level of skill performance. This type of strength is

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

particularly essential for handball players in general and for defensive movements in particular. Therefore, speed–strength occupies a considerable proportion of training time and is closely linked to the degree of technical skill mastery (Abu Al-Ala, 1997, p. 133).

Regarding the phosphagen anaerobic functional variable, represented by the 10-second step test, Table (3) shows statistically significant differences between the pre- and post-tests for the experimental group in favor of the post-test. These marked inexpensive deltas arise from the multiplicity of repeated speed efforts at maximum and sub maximum paces, employed in a well-organized scientific manner. These exercises constituted multi-directional-runs/sores/hurdles/get-ups and variable -speed movements that had a greater effect on anaerobic functional variables.

Handball skills, especially under the modern amendments to the laws of the game that emphasize fast-paced performance, require rapid movements and frequent high-intensity actions. The researchers believe that the nature of training exercises and match movements demands high-speed transitions across the court; as the workload on the body's functional systems increases, reliance on anaerobic energy systems also increases. Consequently, players are able to sustain high-level performance efficiency throughout numerous offensive and defensive situations during the match.

Bishop (2011, p. 756) indicated that performing sprinting actions with changes in direction or executing high-intensity efforts over short durations requires a high level of anaerobic capacity, as anaerobic power is directly associated with muscular strength in accomplishing work within a limited time. Furthermore, the improvement observed in physical abilities—particularly speed–strength—among the experimental group positively influenced their performance in the 10-second step test. This is also something that the scientists put down to the creation of hypoxia within muscle groups which work under high-intensity and transient intervals. The application of maximal along with submaximal intensities, a gradual progression from the submaximal to the maximal loads and the provision of suitable intermittent recovery periods, allowed an extended working muscles' stimulation. Moreover, sport-specific drills which mimicked actual game movement when both ball and opponent were present (i.e., with the ball in and without a defender) took up a large amount of the primary portion of training…worked quite well at increasing players' efficiency in task performance.

With respect to individual defensive movements, represented by the test of intercepting and deflecting the ball among three attacking players, Table (3) indicates statistically significant differences between the pre- and post-tests for the experimental group in favor of the post-test. The enhancement is believed to be a result of the nature of the exercises we designed that aimed at enhancing specific defensive actions for several repetitions under maximal and submaximal speed with-in one exercise and among different vitality levels. This approach enhanced performance efficiency both without the ball and in the presence of an attacking opponent, thereby increasing players' motivation, competitiveness, and engagement during training sessions.

Individual defensive movements represent a preparatory phase for offense and are often associated with rapid transition to defense immediately after ball loss. This was supported by Al-Badri (2013, p. 48), who stated that a player characterized by a high level of motor anticipation is better able to

select the appropriate timing to step out, intercept passes, gain ball possession, and deflect the ball effectively.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Regarding the control group, Table (4) shows improvements in all investigated variables; however, these improvements were of a lesser magnitude compared with those observed in the experimental group. The researchers attribute this development to the diversity of exercises implemented by the coach, without reliance on a single training method, as well as the emphasis on distributing training loads in a manner appropriate to the exercises and the working muscle groups. The training program included varied offensive and defensive movements, speed execution with and without the ball, and drills performed in confined playing areas, which contributed to enhancing players' physical and functional fitness.

The observed improvement in post-test performance is considered a natural outcome of the regular training methods adopted by the coach, whose primary objective was to improve players' performance levels to sustain match play. As the efficiency of the body's functional systems improves, the contribution of the energy systems utilized in handball increases, enabling players to maintain performance efficiency. Ismail (1996, p. 24) defined speed–strength as the individual's ability to overcome resistance using high and varied movement speed to achieve the highest possible movement frequency, such as short-distance sprinting.

Moreover, the coach's reliance on practical experience in designing training units that incorporated physical exercises with varying intensities—including bodyweight resistance, added weights, lateral jumps, and forward–backward movements with and without the ball—contributed to the development of both defensive and offensive performance throughout the training period.

These exercises were applied according to the principle of repetition and involved varied situations with teammates or opponents, which positively reflected on players' responses to different game situations. This supports Mahmoud's (1994, p. 54) assertion that continuous training plays a vital role in enabling players to reach high levels of technical performance in terms of accuracy, integration, stabilization, and mastery of advanced technical skills. This was clearly reflected in the significant differences between the pre- and post-tests in favor of the post-test results.

Presentation and Discussion of the Post-Test Results for the Experimental and Control Groups

Table (5) presents the arithmetic means, standard deviations, calculated *t*-values, and significance levels for the **post-test results** of all research variables for both the **experimental** and **control** groups.

Table5. *Means, standard deviations, t-values, and significance between the experimental and control groups in the post-tests for all research variables*

Test	Unit	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	t-value	Sig.	Significance
Triple hop (right leg)	m	4.028 ± 0.286	3.263 ± 0.434	4.44	0.00	Significant
Triple hop (left leg)	m	3.891 ± 0.980	3.118 ± 0.187	3.41	0.01	Significant
Step test (10 s)	count	62.850 ± 5.366	58.1795 ± 6.0124	1.833	0.04	Significant
Interception & deflection among three attackers	count	4.100 ± 0.567	3.500 ± 0.527	2.449	0.02	Significant

Significant at the 0.05 level when Sig. ≤ 0.05.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Discussion of Results

Based on the results presented in Table (5), statistically significant differences were observed in the post-test results between the two groups in all studied variables, in favor of the experimental group.

With regard to explosive leg power, represented by the triple hop test for the right and left legs, the researchers attribute this superiority to the repeated speed exercises designed to develop hopping and running in multiple directions, both without an opponent and in the presence of an opponent with the ball. In addition, the use of training aids such as cones and elastic resistance bands, applied with appropriate durations and intermittent rest periods, was well suited to developing this essential ability in handball. Al-Moussawi and Talib (2021, p. 165) showed that moving at high speed helps improve strength, speed and range of movement therefore training with elastic bands is an effective way of achieving the development of speed–strength. This type of training may develop further speed and fatigue resistance in the flexor arm and leg muscles, while providing more training time suitable for high velocity play and intense motor skills.

The researchers believe that the exercises applied to the experimental group led to increased efficiency of the leg muscles, which was reflected in improved neuromuscular coordination through the recruitment of an optimal number of motor units during muscular contractions. Some scholars (Shaiky, 1986, p. 74) have confirmed that the results of research demonstrate that various jumping and running exercises improve neuromuscular efficiency, enabling the performance of fast and powerful jumps. Mohamed (2014, p. 26) also emphasized that intramuscular and intermuscular coordination is among the most important factors associated with speed–strength. This improvement can be attributed to the stimulation of the working muscle groups under higher-than-usual intensities, which increases their contraction velocity. Moreover, the researchers note that players' commitment to the training sessions and their competitive and engaging execution of the exercises, without boredom, had a positive effect on the development of their physical abilities. This is consistent with Abdel-Khaleq (2005, p. 138), who stated that the development of speed abilities requires muscular contractions at relatively high velocities or contractions against appropriate resistance.

Regarding the phosphagen anaerobic functional variable, represented by the 10-second step test, the researchers attribute the significant post-test differences in favor of the experimental group to the positive effects of the training program implemented throughout the training units. The presence of an opponent, the use of the ball, maximal and submaximal training loads, and intermittent recovery periods—within a high-intensity interval and repetition training framework—contributed to the development of players' functional variables. Hussein and Qasim Hassan (1998, p. 562) observed that not only are short duration speed exercises useful for neural adaptation in the face of their complexity but also they stimulate motor units and creatine reactions which is a component of fundamental energy systems.. Bishop (2011, p. 756) further emphasized that the ability to sprint with changes of direction or to perform high-intensity efforts over short durations requires a high level of anaerobic capacity, as anaerobic power is closely linked to muscular strength in accomplishing work within a limited time.

In individual defensive actions which divided into interception and deflection test, it was found that; Post-test results were statistically significantly difference between the

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

two group ($p<0.05$), in favor of experimental group as shown in Table (5). The researchers speculate that this can be attributed to the similarity of defensive movements performed during handball training and competition (mirror game-related activity). These exercises constituted plyometric activities in the development of speed or conditioning which allowed players to move from side to side, backward and forward on a continuous basis. To assert an effective defense the player must have a capability and readiness to make the right movements preventing his or her opponent gaining certain advantage. This was confirmed by Aliya Ali and Qasim (2022, p.10) who underscored that the training environment should be as close, or even higher level than the match for optimum training effect to take place. Coaches may cause players to be exposed to different training stimuli, since variation of training units appears as basis for adaptations that develop skill execution more proficiently.

Finally, while acknowledging the effectiveness of the training program designed for the experimental group, the researchers do not underestimate the role of the coach and the training curriculum applied to the control group. The exercises implemented aimed to develop both individual and collective aspects of offensive and defensive performance, which resulted in a relative improvement among control group participants; however, this improvement remained less pronounced when compared with the experimental group.

Conclusions

1. Repeated speed exercises demonstrated a positive and statistically significant effect on the development of speed–strength of the legs (right and left) in the experimental group, indicating the effectiveness of these exercises in improving the ability to generate maximal force in the shortest possible time, as well as increasing muscle elasticity and energy output.
2. Repeated speed exercises effectively contributed to improving the phosphagen anaerobic functional variable in the experimental group.
3. The designed exercises led to a significant improvement in individual defensive **movement**, including ball interception and deflection, in the experimental group. This improvement is attributed to repeated training under maximal and submaximal speeds and game-like situations with the presence of an opponent, which enhanced performance efficiency and increased players' motivation.
4. A lesser degree of improvement was observed in the investigated variables in the control group compared with the experimental group, which can be attributed to the diversity of the coach's exercises aimed at improving general performance and physical and functional fitness.
5. Post-test comparison between groups showed statistically significant toward the experimental group for all variables (leg speed-strength, phosphagen anaerobic capacity and individual defensive movement), demonstrating that RSE was more effective than isolated exercises to provide improvement of those abilities.

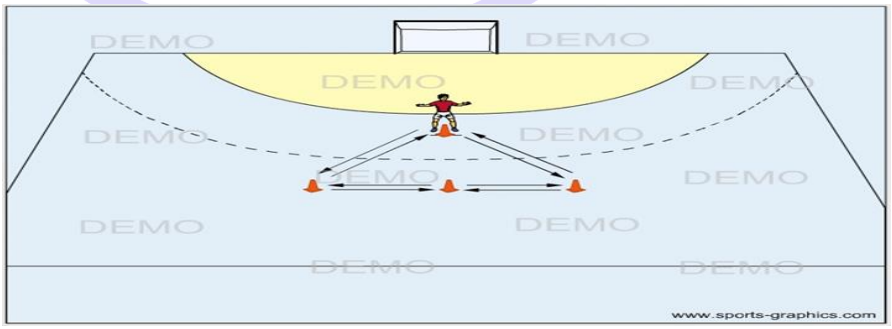
Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

1. From its overall effects, we suggest that RST should be included in the training programmes of handball players at all youth age levels, especially in under-15 players.
2. Coaches should develop training exercises that incorporate short, high intensity sprints with shorter recovery periods, considering the growth characteristics of the musculoskeletal system in young players to avoid excessive fatigue.
3. training exercises more game-like in nature, characterized by competition and challenge, to increase athletes' motivation and focus, as well as work on their efficiency in performing actions widespread when playing defense or stealing the ball.
4. Subsequent studies should explore the impact of RSE with REGARD on other components of handball performance (offensive performance or game-related variables) and others age categories.
5. scientific monitoring of players' functional and physical variables is required to maintain the effectiveness of training programmes and make necessary changes according to players' demands.

Appendix (1)

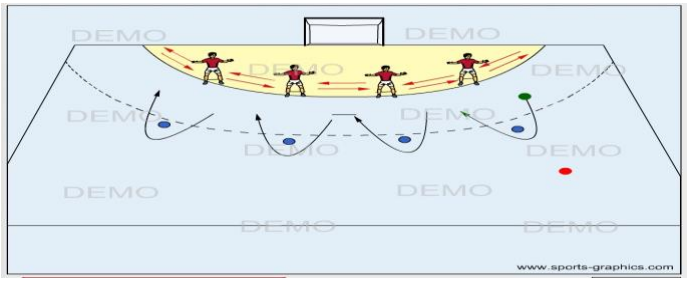
Sample of Repeated Speed Exercises
Exercise (3)
Method of Performance:
The player performs a series of varied defensive movements starting from point A to point C, then returns to the same point. Next, the player moves laterally to point B, retreats backward to point D, then advances forward to point C, and returns backward to the same point. After that, the player sprints to point B, and the sequence is repeated continuously in the same manner.



Exercise (5)
Method of Performance:

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

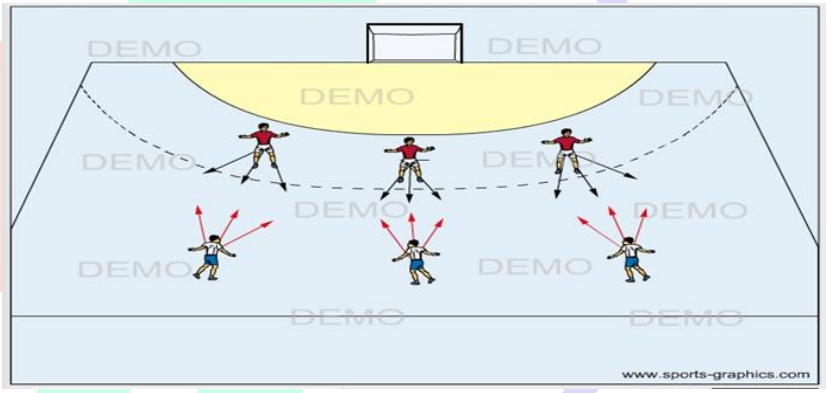
Four defenders perform lateral defensive movements along the 6-meter line while using an elastic resistance band. Upon the coach's signal, the players move forward, circle around a medicine ball, and then return to lateral defensive movements along the same line.



Exercise (9)

Method of Performance:

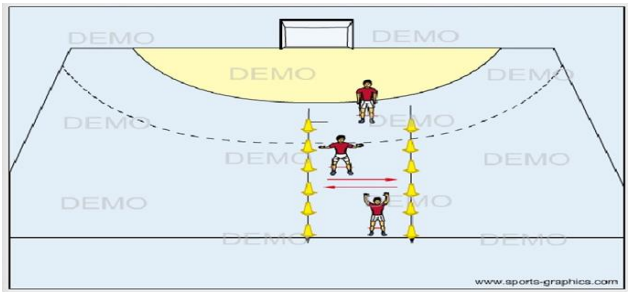
A 1×1 confrontation drill is performed within a confined space not exceeding 3 meters, without the ball. The attacker attempts to pass the defender by moving in different directions, while the defender maintains close proximity, using proper footwork and body positioning to prevent the attacker from breaking through.



Exercise (17)

Method of Performance:

Twelve training poles (cones) are arranged in pairs in front of the player, with a distance of 3 meters between each pair. Upon the start signal, the player moves forward and performs a lateral sliding movement with both legs together, using an elastic resistance band, progressing between the arranged poles.



Appendix (2)

Sample Weekly Training Units

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Day	Date	Exercise No.	Unit Intensity Level	Weekly Intensity Level	Training Volume	Rest Between Repetitions	Sets	Rest Between Sets	Total Exercise Time (min)	Total Unit Time (min)
Saturday	2/11	4	85%		10 s × 3	20 s		90 s	6.0	27.66
		3			12 s × 3	24 s		90 s	7.8	
		17			8 s × 4	24 s		90 s	6.19	
		9			10 s × 5	20 s		90 s	7.67	
Monday	4/11	3	85%	86.66%	10 s × 4	20 s	2	90 s	7.0	30.3
		11			15 s × 3	30 s		90 s	7.5	
		12			10 s × 5	20 s		90 s	8.0	
		20			12 s × 4	24 s		90 s	7.8	
Wednesday	6/11	5	90%		15 s × 3	30 s		90 s	7.5	29.43
		10			8 s × 5	24 s		90 s	8.33	
		6			10 s × 4	20 s		90 s	7.0	
		7			12 s × 3	24 s		90 s	6.6	

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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The Effect of Rehabilitation Exercises Accompanied by A Point-Laser Device on Restoring the Functional Abilities of The Injured Shoulder Joint in Advanced Athletes Participating in Sports Activities

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Abstract

The study aimed to identify the effect of rehabilitation exercises on advanced athletes participating in sports activities who suffer from partial muscle tears in the shoulder joint. The researcher used the experimental method with a one-group design employing pre- and post-measurements, as it suited the nature of the study. The research population was intentionally selected from sports clubs and included athletes aged 20 years and above with partial shoulder muscle tears, while the main sample consisted of five players and an additional two players from the same population were used for the pilot study. The research problem was evident in the high incidence of shoulder injuries among athletes, especially in team sports such as basketball, handball, volleyball, and football goalkeepers, which deprived teams of their participation and affected performance levels. The results revealed statistically significant differences between pre- and post-tests in favor of the post-tests, indicating improvements in muscular strength and shoulder joint range of motion. The rehabilitation exercises combined with the point-laser device contributed to a clear development in shoulder girdle muscle strength and improved range of motion in all directions, leading to the restoration of functional efficiency of the shoulder joint. The researcher recommended prioritizing physical and movement-based rehabilitation before surgical intervention in cases of shoulder tendon tears, emphasizing flexibility exercises due to their significant benefits, training athletes on proper protective movements during sudden injuries—such as correct falling techniques and avoiding landing on fully extended arms by internally rotating the shoulder—and using focused exercises such as anterior and posterior push-ups in their various forms as simple and continuous bodyweight exercises to strengthen the working muscles, given their ease of application at different times and locations.

Keywords: rehabilitation program, partial tear of shoulder joint muscles, range of motion, muscular strength.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Introduction

Sports injuries are a common problem that prevents an athlete from being able to carry on with their training program in an effective manner. The result is a good injury because of the removal from physical activity, so performance (in both physical orientation and skill) drops down. Achieving such predictive capability is very, very difficult, as injuries are often unforewarned events, and even if many studies suggest that the types and locations of some sports activity injuries can be predicted at all. This confirms the importance of the work of the sports specialist who was there at that time since assistance is not always ready during training. Sports medicine is a multilateral approach that requires a combination of the different fields like sports training, physical and motor rehabilitation, physiology, biomechanics, therapeutic massage, morphological (anthropometric) measurements, and anatomy for rendering service to healthy or injured athletes (Al-Ghamri & Bakri 2011; Hassan & Hussein 2021).

Shoulder joint injury is one of the common sports injuries. Given that the shoulder joint involves multiple axes of movement in different directions and wide ranges of motion, this property enhances its susceptibility to injuries compared to other body joints, especially with the execution of complex and demanding motions which load large forces on adjacent musculotendinous units (Agyapong-Badu et al., 2017). Handball, basketball and volleyball have frequented and varied movements, as well as technical offensive and defensive skills. The physical and skillful effort of players during matches and training sessions is necessary for successful performance. The nature of the game creates a lot of pressure on the players that can be found in every direction, sudden movements and fast dynamic changes to realize offensive and defensive actions. During performance of skills, and during defensive-to-offensive and offensive-to-defensive transitions (Hamidi & Jassim, 2025), athletes rely on significant support and propulsion forces from their arms in the forward, lateral, and backward directions. This causes extreme physical stress on muscle and joint, frequently resulting in injury.

As the shoulder joint is one of the most commonly stressed and fatigued joints and, as such, highly susceptible to injury, a vast majority of movements/skills relies on glutening/supporting/pushing through our arms (Khudhair, Jasim, & Hani, 2022). Repeated actions like these may lead to joint instability, and persistent instability can eventually contribute to injury. A study done by Khaled Mahmoud Ezz El-Din (2014) entitled The effectiveness of therapeutic massage and therapeutic exercises on the rehabilitation of the shoulder joint proved that the proposed rehabilitation program positively affected shoulder girdle muscle strength, increased the range of motion of the shoulder joint, and decreased pain intensity. In a similar vein, Struyff, Geraets, and Noten (2016) emphasized that the shoulder joint is essential in a large number of sports—other than swimming, in which the focus is most commonly on the shoulder girdle muscles with their main functions concerning rotation and forward propulsion of an arm—shoulder injuries consequently have an important impact on athletes' practice.

Therapeutic devices, i.e., the combined use of rehabilitation exercises and therapeutic devices adapted to shoulder joint injury, each session significantly improved

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

the range of motion in the shoulder. Based on this, this study suggests an integrated rehabilitation program of therapeutic exercises with modern methods represented by high-intensity point-laser therapy (laser acupuncture therapy). It uses laser beams that do not penetrate the skin to stimulate these points, allowing for a safe and non-invasive treatment. The combination of scientifically structured rehabilitation exercises with anti-stretching and muscle-fixing processes that focus on shaking blood (non)circle circulation to induce healing processes and pain relief, given that this applies to the patients' medical health and injury conditions. Therefore, the exercise program together with therapeutic interventions may improve muscular and joint flexibility as well as muscle strength, leading to pain relief that supports the efficacy of combining exercise-based and conservative options in shoulder injury rehabilitation.

The problem with existing research is that while playing, players rarely do movements whereby they land heavily on their arms because a lot of effort directed by body weight goes into the arm—mostly the shoulder joint muscles. It was noted that several athletes suffered injuries in the muscles surrounding the shoulder joint, which has certainly had an impact on their skills performance and led to many of them withdrawing from training and competition for long periods of time, with some continuing not to participate. That is once a bad loss for both clubs and national teams. In addition, few sport-specific physical rehabilitation programs exist, and modern therapeutic devices are rarely used to treat shoulder muscle injuries in team-sport athletes. Thus, the researcher designed physical rehabilitation exercises for restoring those injured shoulder joint muscles and to make it easier and faster for injured athletes to return back to participation in sports.

The research aims to design exercises, using a point laser device, supervised in the physical rehabilitation of shoulder joint muscles with partial tears for advanced athletes and to find out the effect of these exercises on rehabilitating injured shoulder joint muscles and developing range of motion and muscular strength in the research sample.

Methodology

To fulfill the purposes of the study, he chose the experimental method because it meets the nature of solving the research problem through evidence that has been tested in laboratories and material sources.

The study considered a sample of five premier league club players in Baghdad, with an age range from 20 to 31 years. The sample needed to experience the same type of injury for all participants in the exercise rehabilitation study, so this outcome was specific to the prevalent condition. Accordingly, players with partial tears only occurring in muscles surrounding the shoulder joint were purposefully selected for this study. It was also confirmed that they had never previously completed any rehabilitation programs and they were only treated using exercises devised by the researcher.

Making an accurate diagnosis of the injury was crucial to the integrity of the science but also to ensure that intervention was undertaken precisely. Moreover, this would allow for the possibility of applying these rehabilitation exercises in the future.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

The injury was diagnosed as a joint muscle injury according to Dr. Ghalib Abbas Al-Mousawi, a specialized doctor in joints, orthopedics, and fractures, on 5/1/2025 by conducting field tests specific for injuries of the shoulder joint muscles. Diagnosis: pain in the muscles of the shoulder joints; partial tears of skeletal muscle in the shoulder joint; clear limitation of motion in the shoulder joint.

Tests Used

1. 10-second anterior pressure test.
2. 2-kg medicine ball throwing test.
3. Shoulder joint range of motion test – flexion.
4. Shoulder joint range of motion test – extension.
5. Shoulder joint range of motion test – abduction.
6. Shoulder joint range of motion test – internal rotation.
7. Shoulder joint range of motion test – external rotation.
8. Hand grip strength test.
9. Upper arm circumference measurement.

Research Instruments

Data collection and assessment forms; a goniometer to measure shoulder joint range of motion; a dynamometer to measure grip strength; and a stopwatch (Casio) to record time in seconds.

High-Intensity Laser Therapy

High-intensity laser therapy uses high-energy beams of light to treat pain and promote healing. It can penetrate more deeply into body tissues than other classes of laser and can be used to treat an array of conditions, including muscle and bone injuries, arthritis, and nerve pain. Shoulder Conditions: Fourth-grade laser therapy is the process of penetrating a high-energy beam into the tissues deep down into the shoulders, thus improving cellular regeneration in this part and reducing inflammation. This ultimately allows for pain reduction, increased range of motion in the target area, and exposure to an optimal healing environment and is particularly useful in treating frozen shoulder. Smoke therapy is usually provided by a specialist team and requires multiple sessions for best results—the total number of sessions depends on individual recommendations. High-energy laser therapy has been increasingly used to treat shoulder conditions, but little is known about the support it provides in treatments—the ability to bring relief quickly and promote tissue repair in order for patients to return with minimal pain to their daily routines and sporting activities.

The researcher conducted a pilot study from 9/1/2025 to 12/1/2025 at 4:00 PM in the hall of Haifa Club, Al-Mashtal, Baghdad, on a sample of two players experiencing shoulder joint muscle pain who were not part of the main research sample.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Pre-tests were conducted on 15–16/1/2025. From this point on, the rehabilitation program was applied after a period of two weeks of medical treatment under the supervision of a specialist physician. The rehabilitation physical exercises (in Appendix 1) were prepared by the researcher from Arabic and foreign references. Progression in training intensities and loads was carefully controlled, especially for resistance exercises. The research sample applied the rehabilitation exercises for a period of (6) weeks from 18/1/2025 to 26/2/2025, and the exercises are as follows:

1. The program length was 18 training-units, where three sessions per week (Saturday, Monday, and Wednesday) were conducted.
2. Each rehabilitation session lasted 45–60 minutes, and it gradually increased after each rehabilitation phase.
3. Intensity of training was between 50–60% of the athlete's upper limit.
4. Rehabilitation exercises were performed after a suitable warm-up.
5. Pain ratings were taken into account while performing the exercises.
6. The program consisted of three phases, each lasted two weeks.
7. Every phase consisted of different shoulder joint range-of-motion exercises, stretching for the muscles acting on the injured joint (e.g., rotator cuff), as well as strengthening exercises to improve both static and dynamic muscle strength using movement patterns, starting with simple movements and then progressing to complex ones.

Post-tests were conducted after completing the rehabilitation program on 27–28/2/2025, under the same conditions as the pre-tests.

Results

Table 1. *Pre-test and post-test results for all research variables*

Variable	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	t (calculated)	Significance
Anterior pressure test (10 s)	4.41	1.15	14.81	1.79	15.27	Significant
2-kg medicine ball throw	3.15	1.59	12.09	1.69	8.55	Significant
Shoulder ROM – Flexion (°)	106.00	6.51	144.00	1.58	15.64	Significant
Shoulder ROM – Extension (°)	32.60	1.14	42.80	1.92	13.88	Significant
Shoulder ROM – Abduction (°)	103.20	3.11	133.40	2.96	13.06	Significant
Shoulder ROM – Internal rotation (°)	55.00	1.00	76.20	2.48	17.08	Significant

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Shoulder ROM – External rotation (°)	34.60	1.81	46.00	1.23	7.49	Significant
Hand grip strength (kg)	22.22	1.32	63.22	3.05	39.11	Significant
Upper arm circumference (cm)	15.42	1.42	18.22	0.85	14.02	Significant

Note. *t* critical (df = 4) at α = .05. SD = standard deviation; ROM = range of motion. All differences were statistically significant at $p < .05$.

Discussion

In Table 1, statistically significant differences between pre-test and post-tests of all research variables measured in speed–strength (anterior pressure test), explosive strength (medicine ball throw), shoulder joint range of motion (flexion, extension, abduction, internal rotation, and external rotation), hand grip strength, or upper arm circumference are shown to be significantly higher for the post-tests.

According to the researcher, it is demonstrated how in all analyzed variables—most notably, range of motion at the shoulder joint of the injured shoulder—an improvement was obtained with respect to baseline, which he considers a consequence of physical rehabilitation suggested and associated with point-laser therapy. A variety of shoulder mobility exercises were included in the program, and progressive regular practice led to a significant improvement of joint range of motion in the study sample (Abed Farhan & Housien 2022).

The researcher goes on to elaborate that better range of motion is believed to be not just due to these exercises but rather the reduction in pain before performing them as well and how it pushed injured players to carry out their rehabilitation sessions (Al-Hilaly & Jameel, 2018). According to Riyadh (2005) and Hussein (2023), it is fundamental that the rehabilitation from injury include stretching and strengthening exercises of muscles surrounding the shoulder. Similarly, Riyadh (1999) and Khlaif, Hussein, and Shnawa (2022) reported that flexibility exercises play a direct role in decreasing pain and adhesions as well as restoring the full range of motion of joints. Abdel-Fattah (1998) also showed the importance of a stretching exercise, as it develops flexibility and decreases injury risk and improves physical abilities and speed in recovery as well as muscular pain relief (Abed Khlaif & Salman, 2022).

The researcher ascribes the results of improvement noted in the post-test to this exercise, which is planned on developing static and dynamic muscular strength using different weights as well as body weight at varying positions (Khlaif & Shnawa, 2022). These exercises helped the players build muscular strength. Riyadh (2005) pointed out the importance of strengthening scapular stability muscles with compensatory, stretching, and resistive exercises. According to Salama (2002), continuous muscular training

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

increases blood flow supply to muscles, helps construct neovascularity (new capillary vessels) within tissues of muscle transmission, and enhances the growth process in muscle tissues or the expansion process, leading to and improving the weight and density of fibers after a certain extent is achieved, which, according to flexural, improves the efficiency of muscular performance. Strength training also helps prevent injury to the joints where an impact occurs by strengthening the muscles around that joint (note, however, that heavy weights should never be used in practicing this routine).

According to Mohammed (2008) and Taha and Khalif (2022), the effectiveness of any rehabilitation program is influenced by a number of components, including the injured player's strict compliance with the physician's orders. The researcher ensured this during implementation of the rehabilitation program with point-laser therapy. In particular, the program was tailored and broken down into loads of training progression, from simple to complex forms of exercises and from static to dynamic contraction phases; also, it kept full dedication towards training the scapular stabilizers and rotator cuff muscles, as these are considered the most active muscle groups for performing any overhead shoulder joint task function (Jasim et al., 2021).

The injured limb must regain some degree of ROM and muscle strength relative to the contralateral limb. Venturing into expanding the range of motion globally, recent findings have revealed an extensive program that covers various exercises targeting the specific muscle groups that facilitate shoulder joint movement and augmenting the total shoulder joint mobility range limitations. Incorporating resistance exercises—both with and without weights—as well as flexibility and stretching exercises helped stabilize the joint, practice strength and flexibility training, increase muscle recovery, and improve muscle circumference. According to Riyadh (1999) and Jasim, Abed, & Ibrahim (2023), rehabilitation exercises stimulate and strengthen weak muscles through isometric and dynamic contractions that prevent atrophy due to disuse by reducing pain, enhancing vascular perfusion of muscle tissue, and preserving the elasticity of skeletal muscle fibers.

Additionally, rehabilitation exercises physiologically primarily act to reduce pain through increases in vasodilation and blood flow due to histamine being released into the tissues (Jasim & Ali, 2023), stimulating sensory nerve fibers and decreasing pain perception. According to Al-Kashef (1999), rehabilitation exercises are one of the most natural ways to restore an injured body part or site to its physical and functional abilities, as they promote more rapid removal of blood accumulations while returning muscle and joint functions through the reduction of pain. Shnawa and Jasim (2024) also added that the effectiveness of physical preparation for developing muscular strength and lowering tense muscles increased with reaching a greater joint range of motion, which increases muscle elastic component use at the beginning of movement.

The aforementioned factors resulted in increases in shoulder range of motion, explosive strength, and speed-strength following rehabilitation exercises with point-laser therapy that translated to improved functional, physical, and skill performance of injured players. This decrease in pain levels made it easier and more comfortable for the

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

participants to do the rehabilitation exercises that were a part of the program. As a result, this led to better performance in skills such as the spike and other physical and motor abilities in play so that it was possible to achieve the objectives of the study and get support for its hypotheses regarding rehabilitation of injured shoulder muscles.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Conclusions

1. The employed rehabilitation physical exercises elaborated in this study managed pathology holistically, imitating the property of life, which correspondingly completely eradicated the acute pathologic condition in the pain exam sample.
2. Through this study, we adopted different methodologies with light weights and sandwiches to strengthen the participants in their injured shoulder muscles.
3. The rehabilitation program resulted in a significant increase and improvement in shoulder girdle muscle strength and the range of motion of the shoulder joint, thus restoring its functional performance in all directions.
4. During the skill execution, noticing improvement and development in the level of research sample motor and physical activity appeared.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations

1. Focusing on the rehabilitation of shoulder muscles as soon as an accurate diagnosis is achieved can facilitate treatment, recovery, and return to activity.
2. Strengthening of shoulder girdle muscles of team-sport players is very important because it mainly improves skills and physical performance.
3. During immediate rehab after sport activity, ice application is done to constrict blood vessels and reduce the intensity of pain when injury-related feelings occur.
4. General physical preparedness—meaning various kinds of strength—helps to avoid a lot of injuries, including with the shoulder joint.
5. While working in the specific sport and specialization practiced, trainers should develop training plans targeting all parts of the body.
6. The warm-up should also be done properly, and all major muscle groups should be taken into consideration to keep injuries at bay during upcoming exercise sessions.
7. Stretching and flexibility are very beneficial for the body, so this type of exercise should always come first in a workout regime.
8. It would be better if players were instructed on what to do in the event of an acute injury, such as how to properly fall and not land with arms fully extended; instead, they should internally rotate their shoulder at the point of impact.
9. Push-up variations (anterior as well as posterior push-ups, with or without moving into a plank) are some of the best exercises to be completed daily to strengthen the injured rotator cuff and shoulder muscle groups since they are accessible in every single location, and this can additionally be performed at any time.
10. More studies should examine similar and other injury types not examined in this study.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Appendix (1)
Physical Exercises Used in the Rehabilitation Program

1. Static anterior push-up (isometric push-up).
2. Dynamic anterior push-up (moving push-up).
3. Shoulder Press: The athlete starts seated on the bench or standing, holding up two dumbbells (1–2 kg) overhead, then alternates lowering down to shoulder height and back up. Weights are added according to the athlete's condition.
4. The athlete contacts or erects with the limbs down on waist level, holding 2 dumbbells (1–2 kg), then carries out elbow flexion and extension upward & downward. Weight is added according to the state of the athlete.
5. The athlete lies on the side on a bench, supporting the body with one arm while holding a dumbbell in the other arm at hip level and raising it head-high in a pressing motion.
6. The person executing the exercise lies on a bench with the whole body supported and then raises up the arm to elbow level and supports it on top of the bench to achieve external shoulder rotation by driving upwards and downwards with an upper arm weight in hand.
7. The individual is with the side of their body on a bench or the floor, has one arm flexed, and is moved upward and downward against gravity by the dumbbell in their hand while using light weight.
8. The athlete sits on a bench and has the arm extend laterally while holding a dumbbell, then they raise the straight arm forward and upward as it is lowered again.
9. Forward support position: the athlete drops the body down, holds briefly, then heads up.
10. Seated from the side, the dumbbell hand is raised to 90° and lowered.
11. The athlete is on their stomach on a bench with an arm holding a dumbbell in the vertical position that they are raising and lowering.
12. In a prone position, the athlete lifts and lowers an arm extending from the elbow of the dumbbell horizontally.
13. The lateral cable pull is performed on a multi-gym machine with the leg angled to avoid trunk rotation.
14. Starting from a standing position with both arms extended, holding onto a barbell at thigh level, the athlete lifts up a 10-kg bar from abdominal level to elbow flexed at 90° and then up to shoulder level over several repetitions.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Comparative Study of the Time Variable Between Grab Start and Track Start Types in Freestyle Swimming for Elite Swimmers

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Abstract

Research aims to identify the time variable values between the two types of start: the Grab start and the track start in advanced freestyle swimming, and see the difference of the time variable between the two types of start: the Grab start and the track start in advanced freestyle swimming.

To achieve the research objective, the researcher used a descriptive method using a comparative approach, as it was best suited to the research problem. The research sample was selected purposively, consisting of four (4) advanced swimmers from the national 100m freestyle team, representing 80% of the original research population of five (5) swimmers, due to injury, one of swimmer was excluded. The researchers conducted the test with video recording, and performed kinematic analysis of the swimmers using the Kinovea analysis software to extract the biomechanical variables related to start time. Appropriate statistical analyses were performed, and the researcher concluded that the swimmers achieved a shorter start time in the Grab start compared to starting from the track start, indicating its better in improving the overall performance time of the freestyle swim. The Grab start contributed to reducing the time of the start and entering the water more efficiently, due to faster reaction times and more efficient distribution of kinetic energy. Furthermore, the type of start used had a clear impact on gaining initial speed, which positively affected maintaining movement rhythm during the first meters of the swim race.

The researcher recommends using the Grab start as a basically method in training and competitions in freestyle swimming for the advanced category, due to its superiority in reducing the time variable and improving the achievement, and the necessity of including special training for the start phase within the daily training units, with a focus on developing reaction speed and explosive power of the legs, also the necessity of using video recording and motion analysis to evaluate the swimmers' performance in the start phase and correct technical errors.

Keywords: time variable, Grab start and track start.

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Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Introduction

Swimming sport considered to have an important position among other sports. Its haves a wide fan base and is practiced by all of ages. Certain sciences, particularly biomechanics, play a crucial role in analyzing and diagnosing swimmers' strengths and weaknesses. This provides coaches with a solid scientific foundation and accurate information that helps them enhance strengths and address weaknesses, which positively impacts performance development of sports performance results. Freestyle swimming is one of the most competitive swimming events, as achieving success depends on a combination of technical and physical factors that work together to reduce the overall performance time. The start is one of the most crucial phases in short and middle-distance swimming races, as it directly impacts gaining initial velocity and preservation of kinetic momentum during the first few meters of the race. Swimming requires a focus on developing all aspects of performance, particularly the biomechanical aspect, which is one of the most prominent aspects that becomes evident when analyzing a swimmer's performance during training and competition. Biomechanical variables are clearly visible during the execution of a skill or activity, in terms of force, speed, direction, and the angle of the mechanical action of the movement. Swimmers utilize these variables in accordance with their physiological and physical capabilities and the demands of that skill or activity. Swimming starting techniques have witnessed significant development. The Grab start has emerged as a modern that method aimed to improving reaction time and forward momentum, in contrast to the traditional track start, which is still widely used. These two types differ in terms of the body initial position, the mechanism of force generation, and the angle of the water entry, which is reflected in the time variable during the start stage and the subsequent performance stages. Despite the importance of this stage, it is noticeable that coaches tend to favor a particular type of starting technique without relying on precise scientific data, especially among advanced trainees. This highlights the need for a comparative study that clarifies the time differences between the two starting techniques, thus contributing to the selection of the optimal method for achieving the best results. In a study conducted by Jamil Kadhim Jawad (2003), developing explosive leg power led to increases the amount of propulsive force generated and a faster start. A study by Ali Malik Hamid Al-Shouk (2013) concluded that using a modern starting platform in training national short-distance races swimmers is essential. A study by Hala Hussein Ali (2015) demonstrated strong correlations between the propulsion phase and performance in both the propulsion force and time at the start of the race. This highlights the importance of the propulsion phase and its impact on the final result, as increased propulsion force results from a shorter propulsion time due to the inverse relationship between them, which arises from the speed of joint extension during the propulsion. Finally, a study by Ali Hashim Mohammed (2017) explored the use of a proposed device to improve certain biomechanical variables of the Grab start phase and its relationship to performance in the 50m freestyle for advanced swimmers.

The importance of this research lies in seeking to find the best ways and means that enable coaches to achieve athletic achievement, by revealing and highlighting the crucial role of the starting position in reducing the time of freestyle swimming, as well as providing coaches and swimmers with scientific indicators that help in choosing the most appropriate

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

starting position, and contributing to the development of training programs for the starting stage in line with their physical abilities and the effort exerted during competition.

Research Problem:

Through the researcher's observation of training sessions and competitions for advanced swimmers, a clear disparity was noted in swimmers' time performance levels when using the two starting techniques. Furthermore, there is no clear scientific criterion to determine which technique is superior. Some advanced swimmers possess similar physical and technical abilities, yet their time results differ, which is partly attributed to the starting technique used and its execution.

The problem is further complicated by the scarcity of Arabic studies comparing the Grab start and the track start and their impact on time performance in advanced swimmers. This creates a knowledge gap among coaches and those working in the training field, limiting the possibility of developing training programs for the starting stage based on sound scientific principles.

Therefore, the research problem is defined as the need for a comparative scientific study that reveals the differences in time performance between the Grab start and the track start in advanced freestyle swimming. The aim is to determine the most effective technique for improving time performance and to provide results that can be used to guide the training process and raise the competitive level of swimmers.

Research Objective:

• To determine the time variable between the start of the Grab and the start of the track in advanced freestyle swimming.

• To determine the time difference between the start of the Grab and the start of the track in advanced freestyle swimming.

1-4 Research Hypothesis:

• There are statistically significant differences in time between the start of the Grab and the start of the track in advanced freestyle swimming.

1-5 Study Scope:

1-5-1 Human Scope: Advanced National Team Swimmers.

1-5-2 Time Scope: From (December 26, 2025) to (January 30, 2026).

1-5-3 Spatial Scope: Al-Shaab Olympic Swimming Pool, Baghdad.

Methodology:

Research Methodology:

The researcher used the descriptive method with comparative approaches, as it was suitable for the research problem.

Research Population and Sample:

The research sample was selected purposively. It consisted of (4) swimmers from the national 100m freestyle swimming team in the advanced category, representing (80%)

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

of the original research population of (5) swimmers. One swimmer was excluded due to injury.

Data Collection Methods and Equipment Used in the Research:

Data Collection Methods:

• Arabic and foreign references and sources.
• Personal interviews.
• Data entry form.
• Testing and measurement.
• Pilot study.
• Kinesthetic analysis software (Kinovea).

Equipment and Equipment Used in the Research:

• Three Casio digital electronic timing watches.
• One Lenovo laptop.
• One Japanese-made whistle.
• Two Japanese-made CASIO underwater cameras with a speed of 25 frames per second.
• One Japanese-made CASIO high-speed camera with a speed of 120-1000 frames per second.

Procedures:

Biomechanical Variables (Start Time):

The following mechanical variables are extracted through image analysis using the Kinvea software and the following equation:

Time = Number of Images × Time per Image.

Absorption phase time: This is the time it takes for the swimmer from the moment they begin the movement after the starting position until they reach maximum knee flexion. Propulsion phase time: This is the time it takes for the swimmer from the moment they first extend their knee after reaching maximum flexion until their body reaches full extension. Flight phase time: This is the time it takes for the swimmer from the moment their feet leave the starting block and they take flight until their center of gravity enters the water.

Pilot study:

The researcher conducted the Pilot study on Friday, December 26, 2025, at the Al-Shaab Olympic Swimming Pool at 3:00 PM. The purpose of the test was to verify the functionality and accuracy of the main camera, as well as its proper placement in the main test to ensure accurate of the swimmers' performances.

Main study:

The researcher conducted the main study on Friday, January 2, 2026, at 3:00 PM in the Al-Shaab Indoor Swimming Pool. After setting up the video camera and confirming its functionality, the swimmers warmed up. They then began performing start attempts, with the first swimmer performing their first attempt, followed by the second swimmer, and so on. Each swimmer was given (3) start attempts for the Grab start type and (3) start attempts for the track start type, resulting in a total of (6) start attempts for each swimmer in both

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

types. One attempt per swimmer was used in each start type, based on the longest horizontal distance achieved by the swimmer through analysis of all attempts. The swimmers were filmed from the right side individually. The second track (in the pool) was chosen as the starting point for the test due to its suitability for the positioning of the two underwater cameras. The experiment was conducted with the assistance of the team.

Statistical Methods:

The researcher used the (IBM.SPSS. Ver20) statistical package.

- Mean.
- Standard deviation (SD).
- Skewness coefficient.
- T-test for paired samples.

Results and Discussion:

Analysis and Discussion of Biochemical Indicators:

Table 1.shows the statistics of the time variable results for the two types of start: the Grab start and the track start

significance	Sig	T	track start		Grab start		variable
			SD	mean	SD	mean	
significance	0.00	6.51	0.11	0.60	0.16	0.40	Absorption phase time
significance	0.00	7.41	0.29	0.40	0.12	0.22	Propulsion phase time
insignificance	0.533	2.51	0.23	0.34	0.17	0.30	Flight phase time

Discussion:

After presenting the results of the absorption phase time variable for the two start types in the research sample, the results showed a significant difference between the two start types, favoring the Grab start. The researcher attributes this result to the difference in the body's center of gravity position between the two start types in the ready position. In the track start, the center of gravity is further back than in the Grab start. This increases the time required to move the body forward and downward, away from the leading edge of the starting block, towards the pool. This creates a state of imbalance that helps the swimmer overcome their body's inertia and propel themselves further and faster.

Since the displacement involved in moving the center of gravity forward and downward in the track start is bigger than in the Grab start, this transfer process will take longer (the

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

lower the body's center of gravity, the greater the distance and time required to lift and move it forward) (Risan Khuraibat and Najah Mahdi, 1992, p. 315). Regarding the variable of the push-off phase, the results showed a significant difference between the two types of starts, favoring the Grab start.

The researcher attributes this result to the fact that pushing off with both feet simultaneously in a Grab start generates greater force than pushing off with each foot sequentially, as in a track start. (Many strength training exercises require the use of both limbs, whether the legs together, as in knee flexion exercises or leg presses, or the arms together, as in chest presses from a prone position. In these cases, the force exerted by one limb alone is less than if the performance depended on each limb individually. This phenomenon is called bilateral deficiency. Conversely, bilateral performance may improve more than individual performance of each limb as a result of training in bilateral movement. This is achieved by activating muscle fibers in training the bilateral action of both limbs together, which leads to the force produced by one limb during the bilateral action being greater than the force produced by the same limb in individual performance, as observed in weightlifters in the sport of lifting.) Weightlifting, and the disappearance of the bilateral deficit phenomenon in such athletes is attributed to the role of neurological adaptation to training using both limbs (Abu Al-Ala Ahmed Abdel Fattah, 1997, pp. 117-119). From this, it becomes clear that the amount of propulsive force produced by the swimmer during the burst start (bilateral performance) is greater than that produced during the track start (single-limbs performance). As the force generated in the propulsion phase increases, the time required for this phase decreases. Therefore, a significant difference was observed between the two types of starts in the propulsion phase time variable, favoring the Grab start.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Regarding the flight time variable, the results showed a random difference between the two start types. The researcher attributes this result to the fact that the flight time for a swimmer in a Grab start should be less than the flight time in a track start due to the difference in launch speed, which, according to the research results, favored the Grab start. However, the difference in the launch angle for the research sample between the two start types—the launch angle (below the horizon) in the Grab start being smaller than the launch angle in the track start—caused an increase in flight time in the Grab start because the launch angle in this type of start appeared higher than in the track start (the greater the launch angle, the longer the flight time) (Talha Hussein Hossam El-Din, 1993, p. 310). This led to a convergence in flight time between the two start types, which caused the random difference between them in this variable.

Conclusions and Recommendations:

Conclusions:

• Swimmers using the Grab start achieved faster times compared to starting from the track, demonstrating its greater effectiveness in improving overall freestyle performance time.

• The Grab start contributed to reducing the time of the launch phase and better entry into the water, due to faster reaction time and more efficient distribution of kinetic energy.

• The type of start used has a clear impact on gaining initial speed, which positively affects maintaining movement rhythm during the first meters of the race.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
https://jcope.uobaghdad.edu.iq

Recommendations:

• Adopt the Grab start as a fundamental technique in training and competitions for advanced freestyle swimmers, given its proven superiority in reducing time variance and improving performance.

• Include specific drills for the launch phase in daily training sessions, focusing on developing reaction speed and explosive power of the lower limbs.

• Utilize video recording and motion analysis to evaluate swimmers' performance during the launch phase and correct technical errors.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
(E-ISSN: 2707-5729) (P-ISSN: 2073-6452)
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