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مجلة علمية فصلية مُحكمة متخصصة

بعلوم الرياضة تصدر عن

كلية التربية البدنية وعلوم الرياضة

جامعة بغداد



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وزارة التعليم العالي والبحث العلمي
جامعة بغداد
كلية التربية البدنية وعلوم الرياضة

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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 الاليكتوني، 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 (2021).
- 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) وعنواوينهم (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 الأسم 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 والأختبارات 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 لاعمار 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 لاخذ العينات (إجراءات الاختبارت).
- ✓ 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:

- ✓ لايجوز 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 اذا 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 اسهل فهماً اذا 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 بارقامها (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 بالاتي 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 اوبحوث 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 لاجراء بحثه اذ يُقدم الشكر للشركة، او المؤسسة التي قدمت الأموال لدعم البحث، او المختبرات التي زودت الباحث بالادوات 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 اصل 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 اداوات البحث مثل الاستبيانات وبرامج الحاسوب المستعملة او الأجهزة المصنعة والتي يجب عرضها وشرحها لاهميتها 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 بابعاد 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 اسفل عنوان البحث، في حين تثبت ملعوماتهم (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 وباسعمال 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 المقديمن لبحثهم باللغة العربية ادراج المصطلحات العلمية باللغة الإنكليزية في متن البحث.
- ✓ الاسـتشـهاد بالمصـادر يكون وفق أسـلوب (APA) الإصـدار السـادس حصـراً 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.

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The Relationship Between Team Cohesion Level and Social Skills in Student Athletes

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Abstract

The current study focuses on understanding how cohesion within a sports team relates to social skills among the student-athletes that comprise those teams. Its premise is based on the belief that participating in team-based athletics provides opportunities for not only improved physical fitness but also for developing social and interpersonal competencies. The study was designed to examine whether or not team cohesion and social skills are related, as well as to compare team cohesion and social skills based upon student-athletes' gender, student-athletes' age, and student-athletes' respective sport types. A quantitative research design was utilized, and a social survey was used. Questionnaires were distributed to 250 male and female student-athletes enrolled at Kütahya Dumlupınar University and included demographic information, Team Cohesion Scale and Social Skills Scale. Finally, the data generated were analyzed using the SPSS 26 software. The study utilized several types of data analysis: demographic description (descriptive statistics); comparison of means for independent samples (independent samples t-tests); comparison of means using one factor (one-way ANOVA); correlation of continuous variables (Pearson correlation); and prediction of continuous variables (regression). In addition to the above statistical methods, information regarding the mean, range and standard deviation for all participant demographic characteristics was collected. Student athlete participants demonstrated greater levels of team cohesion as well as improved social skills, relative to those who did not participate in athletics teams. When examining team cohesion and social skills, there were statistically significant differences between teams based on age, gender and type of sport. In addition, a strong positive correlation existed between team cohesion and social skills. Also, based on regression analysis results, team cohesion was found to be a significant predictor of social skills. These findings indicate that by creating a positive team environment, the university sports teams can contribute significantly to student athlete's social skill development.

Keywords: Team cohesion, social skills, student athletes, team sports.

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Introduction

When a student participates in sports during university years, he/she has more opportunities to holistically develop in many ways; therefore, the physical, emotional and social development needs of students are equally important to their success as a whole person. Participation in team sports has the potential to support social interactions and learning through a structured environment, (Jones, 2024) by requiring continued interaction and cooperation, building teamwork skills through ongoing communication, and establishing shared responsibility. Interactions and shared experiences in this setting require the ability of the athlete to emotionally regulate themselves, solve problems and develop interpersonal sensitivity to others. Because of these reasons, the setting of university sports is being developed increasingly as a method to help students socialise and develop their social skills while being an athlete (Eime et al., 2013).

In the context of group dynamics, one of the most significant factors affecting teams in sports is Team Cohesiveness. Many researchers agree on the definition of Team Cohesion as the dynamic process whereby individuals within a team come together to achieve their common goals while also meeting each member's social and emotional needs (Forsyth, 2021). Authors in Sport Psychology discuss two dimensions of Team Cohesion that are strongly interrelated: Task Cohesion is the level of collaboration between teammates towards achieving a performance-related goal, whereas Social Cohesion describes the degree and quality of relationships between team members (McEwan, 2020; Delfgaauw et al., 2022; Worku et al., 2025). Research has consistently demonstrated that increased levels of Team Cohesion are strongly correlated with positive outcomes (Ruan & Liu, 2021; Gu & Xue, 2022), including increased performance, increased motivation, increased perceived collective efficacy, improved psychological well-being, and increased athlete satisfaction.

There is another important area of growth in student athletes - social skills. Social skills are defined as behaviors that are learned through experience that help people engage with their peers in a way that is appropriate for that individual and other people(s) in the environment (Chafaa, 2024; Owiti, 2024). The ability to communicate, work with others, and be empathetic toward other people are a few examples of social skill development. Other examples of social skills development include develop assertiveness, ability to control one's emotions, ability to manage emotions, and ability to resolve conflicts (Patiño-Domínguez, 2024). Social skills have an integral role in the lives of student athletes by helping student athletes establish positive peer relationships, fulfilling team expectations, handling competitive pressure, and balancing school work and athletic obligations. Many studies support the idea that participation in organized sport helps to develop social skills through the creation of a positive, supportive, and cooperative team environment (Jones, 2024; Erdilanita & Ma'mun, 2025).

Recent research has placed an increased emphasis on the psychosocial dimensions of sport. These studies emphasize how the work that athletes do together as a team can provide opportunities for them to develop their individual social skills. Research by Bedir et al., (2023) found that when there is team cohesion, team members develop trust in each other, communicate openly, and support each other, which can provide the ideal setting for athletes to develop their social skills. For example, Gedik, (2024) found that athletes who reported high levels of team cohesion had greater communication and cooperation skills than those who reported low levels of team cohesion. According to Duman, (2023), the effects of team climate on the development of athletes' social competence was negatively

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correlated with interpersonal conflict, while it was positively correlated with increased prosocial behaviour. Adolescent athletes and university athletes who developed strong peer relationships within their teams exhibited a significantly higher level of social competence compared to those who did not develop strong peer relationships. (Železnik Mežan et al., 2025).

It is essential to understand how the team cohesion and social ability of student-athletes work in the setting of education. (Wang, 2024). Student-athletes at university face the challenge of striving for success in both their academics and athletics, often under the immense pressure of being pushed for success in both academics as well as athletics due to time constraints and stressors that impact the psychological health of the student-athlete's social adjustment (Hart et al, 2025). Research shows that the pressure level in the university setting has the potential to increase for some student-athletes as they attempt to juggle their academic requirements with their training and competition needs (Thompson et al., 2024). In this type of environment, cohesive teams can provide great opportunities as a source of support both socially and emotionally, resulting in an increase in feelings of being a part of a family, having psychological safety that allows for effective and open communication, encouraging a sense of emotional regulation, and helping to alleviate the daily stressors that student-athletes experience while balancing life as a university student and life as a student-athlete(Muñoz et al., 2023).

Researchers have cited a number of educational benefits associated with social cohesion among groups of students; this includes supporting successful psychological, social, and academic adjustment, decreasing the negative impact on academic stress levels, and encouraging cooperation and mutual respect among students through the development of positive relationships (Orazani et al., 2018; Yu et al., 2023). Therefore, the degree of "team" cohesion that exists within university sport is also an extremely valuable factor for educational purposes, and the benefits of team cohesion reached far beyond just physical performance; team cohesion plays an important role in the development of social skills and mental health for university student athletes. In contrast to how team cohesion and social skills have been studied as separate constructs, there have only been a small number of studies directly examining how these two variables are related to each other for university student athletes. Additionally, demographic factors (e.g., gender, age, type of sport) appear to have inconsistent effects on team cohesion and social skills; thus, there is a need for further research that is contextualized within the environments in which university athletes compete.

The relationship between Social Skill Competencies of student athletes and team cohesion levels will be studied in this project. Team Cohesion is defined as an individual's perception of how cohesive or supportive their team is to them and how they perceive their ability to work together as a cohesive unit (team) and the bond between them (team cohesion). Social Skills are defined as the social interactions and abilities that a person has to effectively communicate and work together to successfully adapt to a social environment within or outside of their sport environment. The results of this project will contribute to the field of Sports Sciences and Sport Education by identifying the relationships between the two constructs. Furthermore, this project has the potential to contribute to creating a more supportive team environment for student athletes engaging in University Sport programs and providing coaches, educators, and Sports Program Designers with tools to support student athlete social development.

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Materials and Methods

This methodical framework is utilized to assess how the social skill levels of student-athletes influence their performance on their respective sports teams and how those performance levels impact their team cohesion levels. A standardized methodology was chosen for this study in order to collect, analyze, and interpret data on a systematic basis through the use of quantitative techniques. Discussion of the Research Design, Subject Population and Sample Characteristics, Instruments Used to Collect Data and Procedures Used to Analyze Data have also been included to allow the reader to evaluate the transparency, validity, and replicability of this study. The choices of methodology for this study were based upon established research methodologies as well as the current available literature within the discipline of sports science and the field of social psychology.

Research Design

The research team utilized a quantitative correlational study to determine the potential association between team unity and social abilities in student athletes. Correlational studies are valuable for understanding both how strongly related two variables are, as well as what direction those relationships take (Thomas and Zubkov, 2023). By conducting this research, it was possible to find out if having a greater sense of belonging will enhance an athlete's ability to relate to others, specifically within a collegiate athletic environment.

Besides the correlational studies, the researchers also examined how potential differences between the demographic characteristics of the participants may influence their results. These comparisons are common practice in the field of sports science as researchers continue to investigate how these factors impact the well-being of athletes and other factors that influence athletic performance (Sreeni, 2024). The research adhered to the IMRAD format and complied with the ethical standards for research.

Population and Sample of the Study

For this study, the population consists of student-athletes participating in team sports at the university level for the 2025–2026 academic year. The focus on team sports is due to the fact that they require interaction with teammates, collaboration, and the ability to perform as a unit, all qualities necessary for creating team cohesion and developing social skills.

Students participating in collegiate athletics at intercollegiate levels represented the study's accessible participants through convenience sampling whereby any interested student could be recruited to take part, which allowed for easy recruitment as well as voluntary participation with 250 student athlete subjects participating voluntarily in the research.

The subjects were composed of both men and women aged 18 or older, who were grouped by age into three categories: 18 to 20; 21 to 23; and over 24 years old. This study's age groupings were done to evaluate the developmental differences in social skill development and in team cohesion views previously documented in the literature of social skill development and team cohesion perceptions. Informed consent was acquired before data collection for this study, and participants' anonymity and confidentiality during the data collection process were strongly maintained.

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Data Collection Instruments

Researchers collected data with the following three main instruments—Personal Information Form; Team Cohesion Scale; and Social Skills Scale—administered by the researcher's facilitation and control, which allowed for controlled environments as well as the ability to reduce the impact of variables outside the control of the researcher's facilitation. This also delivered consistency in the manner that data was collected.

Personal Information Form

The Personal Information Form prepared by the researchers to obtain demographic information concerning participants such as gender, age, type of sport used for comparison between groups and descriptions of groups, contains multiple choice items that are only considered as a source of descriptive and comparative variables. The significance of collecting these demographic variables provides a basis upon which to identify differences among participants within the context of research conducted in the area of sports science.

Team Cohesion Scale

The Team Cohesion Scale was a standardized measurement of how strongly the members of a team feel connected to one another and how well they work together. The scale included measurements of the degree to which athletes are committed to team goals and the performance objectives of their sport and of the degree to which the individual athletes are connected with each other both personally and socially. Consequently, team cohesion is a multidimensional entity that has a significant impact on either the success of a team or the satisfaction of the individual athlete (Sezer & Durdubaş, 2023). The Team Cohesion Scale has several items that are rated using a Likert-type scale. The higher the score on the scale, the greater the individual's feelings of being part of a cohesive team. Prior research has demonstrated acceptable psychometric properties of the Team Cohesion Scale regarding the reliability and validity of the construct of team cohesion (Sezer & Durdubaş, 2023). In this study, we found the Team Cohesion Scale exhibited satisfactory levels of reliability as determined via an internal consistency analysis.

Social Skills Scale

A validated Social Skills Scale was used to assess the participants' social skills. The scale assesses how well a person can communicate interpersonally, cooperate with others, empathize with others, and interact socially in a successful way. Social skills are very important psychosocial characteristics for all athletes, especially for athletes who participate in team sports, because they promote cooperation, resolve conflict and create a positive group atmosphere (Ataş et al., 2016). The scale has a Likert-type response format in which the greater the score, the more competent the athlete is in their social skills (Ataş et al., 2016).

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS 26) was used for the data analyses performed in this study. The first analyses performed were descriptive statistics: frequency, percentage, mean, and standard deviation, which helped in providing a summary of participant demographics and total scale scores. After collecting descriptive statistics,

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skewness and kurtosis were calculated to evaluate whether the sample was normally distributed; all results suggested that parametric statistical analyses could be performed. To investigate the possibility of differences in team cohesion and social skills by gender, an Independent Samples t-test was used. To examine differences among age categories and to distinguish between various sports, a one-way ANOVA was performed. When statistically significant differences were observed, post-hoc analyses were used to evaluate where those differences originated. The correlation between team cohesion and social skills was investigated using the Pearson product-moment correlation coefficient analysis and its applicability as a means to assess a linearly related continuous variable. Further, simple linear regression analysis was completed to provide insight into the predicted impact of team cohesion on social skills, with an established level of statistical significance of $p < .05$ for each analysis.

Results

In the next section, we will discuss the data collected from the research via Tables. The results have been divided up according to the following five categories: demographic characteristics, descriptive statistics, difference tests, correlation analyses and regression analyses.

Table 1. *Distribution of Participants According to Demographic Characteristics*

Variable	Category	n	%
Gender	Male	145	58.0
	Female	105	42.0
Total		**250**	**100**
Age	18–20	78	31.2
	23–21	112	44.8
	24 and above	60	24.0
Total		**250**	**100**
Type of Sport	Football	72	28.8
	Basketball	55	22.0
	Volleyball	63	25.2
	Other team sports	60	24.0
Total		250	100

Table 1 shows that the research sample was comprised of 250 student-athletes. The majority (58%) of the participants were male. The age distribution was as follows: 44.8% of the participants were in the 21-23 age range. When looking at the number of each type of athlete, the largest subgroup was made up of football players (28.8%), followed by athletes who play volleyball (25.2%), basketball (22.0%) and other team sports (24.0%).

Table 2. *Descriptive Statistics of Team Cohesion and Social Skills Variables*

Variable	n	Mean ($\bar{X}$)	Std. Deviation
Team Cohesion Level	250	6.42	0.84
Social Skills Level	250	6.18	0.79

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The descriptive statistics for cohesive teams and social skills of student athletes are reported in Table 2. The results indicate that the level of cohesive teams was very strong (M = 6.42). Additionally, students reported a very high level of social skills (M = 6.18). In addition to the descriptive means, the standard deviation values indicate that respondents had a moderate amount of variation, or an adequate consistency of perception relative to both cohesive teams and social skills.

Table 3. *Team Cohesion and Social Skills Levels According to Gender*

Variable	**Gender**	**Mean (X̄)**	**Std. Deviation**	**t**	**p**
Team Cohesion	Male	6.55	0.81	2.48	**.014***
	Female	6.24	0.86		
Social Skills	Male	6.30	0.77	2.11	**.036***
	Female	6.02	0.80		

P <.05

As depicted in Table 3, we analyzed gender differences in regard to team cohesion and social skills using the independent samples t-test method. It has been demonstrated through statistical analysis that there exists a significant difference between males (greater than females) regarding team cohesion and social skills for male student athletes. The male participants recorded a greater mean score than the female participants concerning both team cohesion and social skills. Thus, gender appears to significantly influence the perceived level of team cohesion and social competence among student athletes.

Table 4. *Team Cohesion and Social Skills Levels According to Age*

Variable	**Age Group**	**Mean (X̄)**	**Std. Deviation**	**F**	**p**
Team Cohesion	18–20	6.21	0.88	4.62	**.011***
	23–21	6.48	0.80		
	24 and above	6.63	0.82		
Social Skills	18–20	5.98	0.83	3.98	**.020***
	23–21	6.22	0.76		
	24 and above	6.37	0.77		

P <.05

Table 4 provides a statistical view of a one-way ANOVA conducted to analyze variances of team cohesion and Social Skills across age brackets. Statistically significant variances existed in Team Cohesion and Social Skill levels with respect to an individual's Age group. The younger adolescent group, individuals between (18-20), were at a disadvantage in developing both Team Cohesion and Social Skills versus adolescents that are older (21-23) and those individuals that are 24 and older. This may suggest that older adolescents and adults may have gained additional experience in Team Cohesion and/or Social Skills based upon the increased Age of the individual.

Table 5. *Team Cohesion and Social Skills Levels According to Type of Sport*

Variable	**Type of Sport**	**Mean (X̄)**	**Std. Deviation**	**F**	**p**
Team Cohesion	Football	6.58	0.79	5.21	**.002***
	Basketball	6.31	0.85		

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	Volleyball	6.47	0.81		
	Other team sports	6.18	0.88		
Social Skills	Football	6.35	0.75	4.74	**.003***
	Basketball	6.10	0.80		
	Volleyball	6.28	0.77		
	Other team sports	5.97	0.84		

P <.05

Table 5 displays the results of the one-way analysis of variance (ANOVA) of Team Cohesion and Social Skills levels of Student Athletes based on Sport Type. The results show that there was a statistically significant difference in both Team Cohesion and Social Skills levels among the Student Athletes that participated in various types of Team Sports. The Mean scores were reported to be higher for Football and Volleyball than the Mean scores reported by the Basketball players and Student Athletes who participate in other types of Team Sports. Therefore, the results indicate that the Sport Types and associated dynamics of each of the Team Sports may have a considerable impact on an individual's ability to improve Team Cohesion and Social Skills.

Table 6. *Results of Pearson Correlation Analysis*

Variables	**r**	**p**
Team Cohesion – Social Skills	.68	.000**

P <.01

The findings in Table 6 show the results of a Pearson correlation analysis that studying the relationship between team cohesion and social skills of student athletes. There was a strong (positive) statistically significant relationship between team cohesion and social skills of student athletes ($r = .68$, $p < .01$). Higher levels of team cohesion correlated with higher levels of social skills for student athletes.

Table 7. *Results of Simple Linear Regression Analysis*

Variable	**B**	**Std. Error**	**β**	**t**	**p**
Constant	1.42	0.38	–	3.73	**.000**
Team Cohesion	0.74	0.05	.68	14.80	**.000****
R:68. R^2:.46, F: 219.2, p:000.					

P <.01

The analysis of the effects of team cohesion on the development of social skills in student athletes was completed using simple linear regression. In the results shown in Table 7, team cohesion has a statistically significant correlation with social skills ($\beta = .68$, $p < .01$), indicating that it is a significant predictor of student athletes' social skills. The model also indicates that approximately 46% of the variance ($R^2 = .46$) in social skills is accounted for by team cohesion, showing that increased levels of team cohesive have considerable impact on the development of social skills in student athletes.

Conclusions

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In this research, we explored relationships between the amount of team cohesion that an athlete experiences within their sport and how much social skill the athlete demonstrates. We also investigated if there were differences in the amount of team cohesion and social skills demonstrated by athletes based on the athlete's gender, age, and type of sport in which they participated. The results indicate that student athletes tend to have a high level of team cohesion and social skills, suggesting that participating in a team environment during college is beneficial for development of these skills.

Clearly shown throughout this study is that team cohesion is a vital social-psychological component of the development of social skills in student-athletes. The strong and positive correlation between team cohesion and social skills can be interpreted as meaning that having a greater sense of unity, cooperation, and shared objectives among teammates leads student-athletes to develop better communication skills, ability to work well with others, and ability to adapt socially. It was determined by the results of the regression analyses, which showed that team cohesion is a significant predictor of social skills and accounted for a large percentage of the variance in the dependent variable, that team cohesion not only develops through social interactions, but that it is also a major contributor to the development of students' social skills.

The differences that exist based on one's gender (male vs. female), age (younger vs. older), and type of sport (team vs. individual) reflect how complexly constituted the ways in which individuals become socially competent through their participation in the various types of team sports and, as such, how they develop team cohesiveness through their participation in those sports. The research indicates that male student athletes tend to report higher levels of team cohesion than female student athletes. This is likely a result of differences in their respective competition environments, socialisation patterns, and sport participation. The study also highlights age-based differences in terms of experiencing sport (i.e., older student athletes having greater experience in sport, combined with greater exposure to working with others on a team). Lastly, it identifies that because of the structure and interactional nature of some types of team-based sports, they provide an opportunity for the development of different levels of team cohesion and social competence.

In total, the empirical study supports the findings within the literature and indicates that team cohesion is a key factor in developing social skills in collegiate student-athletes. From a practical standpoint, the study shows the value of developing team environments that foster loyalty, respect, and accountability. The benefits of team cohesion are evidenced by improved athletic performance as well as providing opportunities for holistic development for students through the development of their social and interpersonal skills.

Recommendations

The results and conclusions of this investigation offer several recommendations for practitioners, organisations, and future research.

The first recommendation is to create a training program for sports administrators and coaches that promotes team cohesion. To build relationships between team members and encourage commitment to being part of a group, team-building exercises, cooperative training tasks, and open communication practices need to be incorporated into the team's regular training schedule.

As well, coaches and sport educators should understand the importance of team cohesion in developing social skills. Professional development and workshop training

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should provide coaches with strategies to encourage an inclusive climate within a team and to foster open communication and conflict resolution amongst team members.

Thirdly, we need to pay special attention to groups who tend to show lower levels of social skills or cohesion within their teams; examples of these groups are younger athletes and athletes who have just started with university teams. Orientation programs and mentoring systems that target new athletes paired with experienced athletes may lead to better integration between the two groups and increase team cohesion.

Fourthly, since we find that there are differences based on types of sports, we should develop approaches for enhancing team cohesion that are specific to each type of sport. Interventions designed to enhance cohesion should consider the unique interaction patterns and demands of team sport.

There will also be a need for future research that uses longitudinal designs to better understand how team cohesion and social skills develop over time and to provide information on the causal relationships between those two variables. Researchers may wish to use qualitative data collection methods, like interviews or focus groups, to gain an in-depth understanding of how student-athletes perceive and experience their respective sports. Future research should be inclusive of psychological variables, such as motivation, leadership, and self-efficacy when building comprehensive models that explain the social aspect of sport. This information would aid in developing better university sport programs, as well as helping promote the social development of student-athletes.

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The Effect of External Focus of Attention Strategy on Learning the Volleyball Spike Skill Among Students of the College of Physical Education and Sports Sciences

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Abstract

The study aimed to develop an educational program based on the External Focus of Attention Strategy and to investigate its effect on learning the volleyball spike skill among second-year students at the College of Physical Education and Sports Sciences Al-Mustansiriyah University. The researcher employed the experimental method using an equivalent groups design due to its suitability for the nature of the study. The research sample consisted of 28 students who were randomly assigned into two equal group an experimental group (n. 14) and a control group (n. 14). The study variable was the technical performance of the volleyball spike skill which was evaluated using a specially designed technical performance assessment form. The educational program was implemented for seven weeks at a rate of one instructional unit per week with the External Focus of Attention Strategy applied to the experimental group. The results revealed statistically significant differences between the pre- and post-tests for both groups in favor of the post-tests. Furthermore the experimental group significantly outperformed the control group in the post-test of technical performance of the volleyball spike skill. The researcher concluded that the External Focus of Attention Strategy was effective in learning the volleyball spike skill and improving its technical performance among the participants. The study recommends incorporating the External Focus of Attention Strategy into instructional units designed for teaching volleyball skills and conducting similar studies on different samples and age groups.

Keywords: External Focus of Attention, Motor Learning, Volleyball Spike Skill, Technical Performance, Volleyball .

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Introduction

In recent decades , there have been rapid developments in sports and educational sciences that have directly impacted the methods of teaching and developing motor skills in various sports. Scientific advancements in the fields of motor learning and motor control have contributed to the emergence of modern educational strategies aimed at improving the learning process accelerating the acquisition of motor skills and enhancing the quality of technical performance. Motor learning is considered one of the fundamental sciences in the field of physical education and sports sciences due to its focus on studying the mechanisms associated with acquiring , developing and retaining motor skills as well as researching the factors influencing the improvement of motor performance and directing the learning process toward the best possible outcomes (Magill & Anderson, 2010; Hassan & Abdulkareem, 2025).

Among the recent trends that have garnered wide attention in motor learning research is the external focus of attention strategy which relies on directing the learner's attention toward the effect of movement or its outcomes in the surrounding environment rather than focusing on body parts during performance . Many studies have shown that external focus contributes to improving the efficiency of motor performance and enhancing the learning process by promoting the automatic organization of movement and reducing conscious interference in skill execution leading to smoother and more effective performance compared to internal focus (Schmidt & Lee, 2025; Abdel Salam, 2025) .

Volleyball is considered one of the team sports that has witnessed significant development in teaching and training methods due to the continuous changes in the game's rules and its technical and tactical requirements . This has necessitated the adoption of modern educational methods that help in learning the basic skills more effectively . The technical performance of the perfected spike skill is considered one of the essential requirements for achieving success in this game especially in light of the significant developments witnessed in modern sports competitions (FIVB, 2022; Tilp, 2017; Hassan & Abdulkareem, 2026) .

The skill of the spike is considered one of the most important offensive skills in volleyball and has the greatest impact on the game's results as it represents the main means of scoring points and achieving offensive superiority over the opposing team. This skill requires a high level of motor coordination, timing precision and body control during the phases of approach , ascent , ball striking and landing. The learner's success in acquiring this skill also depends on their ability to organize the various components of motor performance within an integrated motor model that achieves precision and effectiveness in performance (Coleman et al., 1993; Reeser et al., 2006; Al-Aboudi, 2025) .

Recent studies have confirmed that directing the learners attention toward the results of technical performance in the surrounding environment is one of the effective methods for improving the learning of complex sports skills as it contributes to increasing the efficiency of motor performance and enhancing the acquisition and retention of skills for longer

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periods . In the field of volleyball studies have indicated that using instructions related to external focus of attention leads to improved quality of technical performance and increased speed of learning offensive skills compared to traditional teaching methods (Slovák et al., 2023; Majeed, 2026) .

Thru the researcher's observation of the practical lesson in volleyball and field observations of students from the College of Physical Education and Sports Sciences it became evident that there is a disparity in the level of learning the spiking skill and a relative weakness in the quality of technical performance among some learners. This may be due to the reliance on traditional teaching methods that do not adequately utilize modern principles of motor learning . Based on the importance of the spike skill in volleyball and the significance of the external focus of attention strategy as one of the modern trends in motor learning this study was conducted to identify the impact of the external focus of attention strategy on learning the spike skill among students of the College of Physical Education and Sports Sciences .

The research aims to develop an educational program based on the external focus of attention strategy in learning the smash skill among second year students in the College of Physical Education and Sports Sciences as well as to identify the impact of this strategy on the level of learning the technical performance of the smash compared to the traditional educational method .

The researcher hypothesizes the existence of statistically significant differences between the pretest and posttest results for the experimental group favoring the posttests in learning the smash skill. Additionally , he hypothesizes the existence of statistically significant differences between the experimental and control groups in the posttests favoring the experimental group.

The human domain is represented by second year students in the College of Physical Education and Sports Sciences at Al-Mustansiriya University while the temporal domain extended from 11/12/2022 to 2/2/2023 . The spatial domain is represented by the sports fields and halls affiliated with the College of Physical Education and Sports Sciences at Al-Mustansiriya University where the research procedures and tests were conducted .

Methods and Tools

Study Design

The researcher adopted the experimental method using the matched groups approach due to its suitability for the nature of the research problem and achieving its objectives as the experimental method is considered one of the most appropriate scientific methods for studying the impact of independent variables on dependent variables and revealing causal relationships between them under controlled conditions . This method was chosen as it is the most suitable for studying the effect of the external focus of attention strategy on learning the smashing skill among students of the Faculty of Physical Education and Sports

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Sciences by comparing the performance level of the smashing skill between the experimental and control groups .

Participants

The research sample consisted of second year students in the College of Physical Education and Sports Sciences at Al-Mustansiriya University for the academic year (2022–2023) with the sample comprising (28) students randomly selected from the research population of (95) students . The sample was divided into two equivalent groups : an experimental group and a control group with (14) students in each group according to the matched groups method . Students who had failed or were deferred as well as those with prior experience or regular practice in volleyball were excluded from the sample to ensure the homogeneity of the sample members and the similarity of their educational and skill levels before starting the experiment .

Equivalence between the experimental and control groups was conducted in the study variable represented by the performance of the smashing skill in order to ensure the equivalence of the sample members and the proximity of their skill levels before starting the main experiment . To verify the equivalence of the two groups the researcher used the independent samples T-test to extract the significance of the differences between the two groups in the pretest. The results showed no statistically significant differences at the 0.05 significance level indicating the equivalence of the two groups in the level of technical performance of the smashing skill . This equivalence is an important indicator that allows attributing any differences that may appear in the posttest to the effect of the external focus of attention strategy used in the research , as shown in Table (1).

Table 1. *Equivalence Between the Experimental and Control Groups in Spike Skill Performance*

Variable	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	Calculated *t*-Value	*p*-Value
Spike Skill Performance (Score)	10.57 ± 1.43	10.36 ± 1.38	0.40	0.69

The tools used

- A legal volleyball courts .
- Legal volleyball net .
- Legal volleyballs number (8) .
- Whistle .
- Measuring tape .
- Colored adhesive tape to mark performance areas within the field .
- Video camera .
- Camera tripod .
- Laptop .
- Technical performance evaluation forms for the smashing skill .

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- Result recording forms .
- A team of experts and specialists to evaluate technical performance .
- Rubber bands and auxiliary educational tools used during the implementation of educational units .

Study Variables

The study variable is represented by the technical performance of the spike skill in volleyball which included the evaluation of the stages of technical performance of the skill namely the approach , jump , hit and landing . This was aimed at identifying the impact of the external focus of attention strategy on learning the spike skill among the research sample individuals .

Evaluation of the technical performance of the spiking skill

The researcher relied on a performance evaluation form for the technical skill of the spike in volleyball . The performance of the sample members was recorded while executing the skill and the recordings were presented to a group of experts and specialists in volleyball and motor learning for the purpose of performance evaluation .

- **The purpose of the test :** Measuring the level of technical performance of the spiking skill .
- **Tools used :**
  - Official volleyball court .
  - Legal volleyball net .
  - Legal volleyballs .
  - Digital video camera .
  - Camera holder .
  - Performance evaluation forms .
  - A computer to display the recordings .
- **Performance method:** The student stands in position (4) and the teacher or assistant prepares the ball appropriately then the student performs the spike skill toward the opponent's court . The performance is filmed on video for all sample members under the same conditions for the purpose of evaluating the technical performance of the spike skill .
- **Registration method :** The technical performance is evaluated by three specialized experts according to an assessment form prepared for this purpose . It includes the stages of technical performance for the skill represented by the approach take-off , ball strike and landing, with 5 points awarded for each stage of performance . The points are then summed to obtain the total score for the technical performance . The average of the three experts' scores is considered the final grade for the student as shown in Table 2 .

Table 2. *Technical Performance Evaluation Form for the Volleyball Spike Skill*

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Technical Phase	Evaluation Criteria	Score
Approach	Performs the approach steps with correct rhythm and appropriate movement sequence	2
	Maintains balance during the approach	1
	Reaches the appropriate take-off point	2
Subtotal		5
Take-off	Uses the arms correctly during take-off	2
	Performs an effective combined vertical–horizontal take-off	2
	Maintains balance during the flight phase	1
Subtotal		5
Ball Contact	Contacts the ball at the highest possible point	2
	Directs the ball accurately toward the opponent's court	2
	Demonstrates coordination between arm and trunk movements during the spike	1
Subtotal		5
Landing	Lands with proper balance on both feet	2
	Flexes the knees appropriately upon landing	2
	Returns to the ready position after landing	1
Subtotal		5
Total Score		20 points

The performance evaluation form was presented to a group of experts and specialists in motor learning and volleyball to verify its apparent validity and suitability for evaluating the technical performance of the spiking skill . It was approved after making the modifications suggested by the experts . The performance of the sample members was also recorded on video and presented to three specialized experts, and their average scores were adopted as the final grade for each student .

The Polit Study

The researcher conducted a preliminary exploratory experiment on Wednesday , December 21, 2022 on a sample consisting of (5) students randomly selected from the original research community and they were excluded from the main experiment. The aim of this experiment was to determine the suitability of the instructions related to the external focus of attention strategy for the research sample and to ensure their clarity and ease of application during the learning of the smashing skill . It also aimed to determine the time required to implement the educational units and the tests used identify the difficulties and obstacles that might be encountered during the main experiment and work on overcoming them as well as ensuring the validity of the tools and devices used and the efficiency of the filming procedures and technical performance evaluation by experts . The results of the exploratory experiment contributed to making some necessary organizational adjustments to ensure the proper implementation of the main experiment and the achievement of the research objectives .

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Procedures

Pretests

The researcher conducted the pretests for the research sample on 11/12/2022 where the technical performance of the spiking skill among the sample members was evaluated using the prepared performance evaluation form for this purpose . This was aimed at determining the level of the spiking skill of the students and ensuring the equivalence of the experimental and control groups before starting the main experiment .

The Main Experiment

After conducting the pretests the researcher began implementing the educational program based on the external focus of attention strategy on the members of the experimental group on 18/12/2022 while the control group continued learning according to the teaching method followed by the subject teacher . The program was implemented for a consecutive period of (7) weeks with one educational unit per week resulting in a total of (7) educational units. Sixty minutes of the main part of the educational unit were allocated to the implementation of the educational program totaling 420 minutes of application time and the experiment was completed on 29/1/2023.

The educational program for the experimental group relied on the external focus of attention strategy by directing learners' attention toward the technical performance of the skill and its impact on the surrounding environment instead of focusing on the positions of body parts during performance . To achieve this the researcher used standardized verbal instructions throughout all educational units focusing on directing the ball toward specific areas within the field and tracking its path and landing spot after hitting . Examples of these instructions include : "Aim the ball toward the target area" "Focus on where the ball lands on the court" "Make the ball cross over the net toward the designated target" and "Follow the ball's path after it leaves your hand" .

Each educational unit included a brief explanation of the smash skill and a practical demonstration of the correct performance followed by the implementation of educational activities that included the stages of approach , ascent , hitting the ball and landing while continuously providing external focus instructions for attention during practice. The members of the experimental group also received feedback related to performance outcomes which included the accuracy of ball direction , its landing spot and its trajectory without focusing on the mechanical details of the movement . As for the control group they received the standard educational curriculum followed at the college which included explaining the skill demonstrating a performance model and applying the usual educational exercises without using external focus instructions for attention.

To ensure the integrity of the experimental design and the consistency of the application procedures the researcher was keen to standardize all variables related to the

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teaching process between the two groups including the duration of the educational unit the number of practice sessions the tools used the location of the application and the instructor. Thus , the only difference between the two groups was the use of the external focus of attention strategy with the experimental group only. The researcher also directly supervised the implementation of all educational units to ensure adherence to the specified instructions throughout the duration of the program .

Table 3. *Educational Activities Based on the External Focus of Attention Strategy Used for Learning the Volleyball Spike Skill*

No.	Educational Activity	Activity Objective	External Focus of Attention Instruction	Duration
1	Approach toward the net using progressive steps	Learn the correct movement rhythm of the approach	Focus on reaching the designated take-off marker on the floor	5 min
2	Take-off in front of the net without a ball	Improve take-off timing	Focus on reaching the highest point above the net	5 min
3	Spiking a stationary suspended ball	Learn the optimal ball contact point	Focus on directing the ball toward the designated target	5 min
4	Spiking from a set delivered by the instructor	Improve coordination between the approach and the spike	Focus on the ball's trajectory after it leaves the hand	5 min
5	Spiking toward designated target areas on the court	Improve control of performance outcomes	Focus on where the ball lands within the designated target area	5 min
6	Straight spike from Position 4	Learn the straight spike technique	Focus on hitting the designated target area on the court	5 min
7	Cross-court spike from Position 4	Learn the cross-court spike technique	Focus on directing the ball toward the designated corner	5 min
8	Integrating the approach, take-off, and spike	Develop smooth and coordinated skill execution	Focus on sending the ball to the designated target after the spike	10 min
9	Spiking after a moving set	Improve performance under game-like conditions	Focus on where the ball lands in the opponent's court	5 min
10	Full spike execution in simplified game situations	Reinforce learning and transfer it to game situations	Focus on achieving the final movement goal of the skill	10 min
Total				60 min

Posttests

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After completing the educational program based on the external focus of attention strategy the researcher conducted posttests for both the experimental and control groups to identify the extent of improvement in learning the smashing skill among the sample members . The students technical performance was evaluated using the approved technical performance evaluation form in the study under the same conditions in which the pretests were conducted in terms of the application location , the tools used , the assisting team and the execution mechanism to ensure the accuracy and objectivity of the results. The performance of the sample members was also recorded and presented to specialized experts to evaluate the technical performance according to the criteria specified in the evaluation form with the aim of revealing the changes that occurred in the level of learning the smashing skill as a result of applying the educational program based on the external focus of attention strategy .

Statistical Methods

The researcher used the Statistical (SPSS) to process the research data and extract the results. The arithmetic mean and standard deviation were relied upon to describe the data and the independent samples T-test was used to verify the equivalence of the two groups and compare the posttest results between them. Additionally , the paired samples T-test was used to identify the significance of the differences between the pretest and posttest results for each group with the aim of revealing the impact of the external focus of attention strategy on learning the smashing skill among the research sample members .

Results

Table 4. *Means, Standard Deviations, t-Values, and Significance Levels for the Experimental and Control Groups in Volleyball Spike Skill Performance During the Pre- and Post-Tests*

Group	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Calculated *t*-Value	*p*-Value
Experimental	10.57	1.43	17.86	1.12	15.37	0.000
Control	10.36	1.38	14.71	1.27	8.42	0.000

Table 5. *Means, Standard Deviations, t-Value, and Significance Level for the Experimental and Control Groups in the Post-Test of Volleyball Spike Skill Performance*

Variable	Experimental Group Mean	SD	Control Group Mean	SD	Calculated *t*-Value	*p*-Value
Volleyball Spike Skill Performance (Score)	17.86	1.12	14.71	1.27	6.98	0.000

Discussion

The results of Tables (4) and (5) showed statistically significant differences between the pre-test and posttest for both the experimental and control groups in favor of the posttests. However , the extent of improvement in the technical performance of the smashing

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skill was greater in the experimental group compared to the control group. The researcher attributes this development to the effectiveness of the external focus of attention strategy used during the educational program as it contributed to directing learners attention toward the outcomes of the movement and its impact on the surrounding environment instead of focusing on the details of body parts movements during performance. This helped improve motor organization and enhance the quality of technical performance of the skill.

The researcher believes that the verbal instructions based on the external focus of attention strategy helped learners concentrate on the desired motor goal, the ball's trajectory and its landing spot on the field which led to improved motor fluidity and coordination between different performance stages . This result aligns with what Schmidt & Lee (2025) indicated that directing the learner's attention toward the impact of movement and its outcomes contributes to improving motor learning and performance efficiency better than focusing on the internal movements of body parts . It also aligns with the findings of Slovák et al. (2023) and Nema & Ismaeel (2022) which indicate that adopting teaching methods that focus on the requirements of technical performance contributes to the development of offensive skills and the improvement of technical performance quality in volleyball .

The posttest results also showed that the experimental group outperformed the control group in the technical performance of the smashing skill. The researcher attributes this to the fact that the external focus of attention strategy provided a more conducive learning environment for motor learning as it helped learners acquire the correct motor pattern of the skill by focusing on the outcomes of performance rather than the mechanical details of the movement . This positively reflected on improving the coordination between the stages of approach , take-off , hitting the ball and landing contributing to the overall technical performance of the skill .

This result aligns with what Tilp & Wagner (2021) mentioned that learning complex motor skills in volleyball requires the use of modern teaching methods that help improve motor control and enhance technical performance efficiency. It also aligns with the results of (Zetou et al., 2022; Shilkam et al., 2025) which confirmed that the use of modern educational strategies contributes to improving the learning of offensive skills and enhancing the performance level of physical education and sports science students . It was also clarified by (Palao et al., 2009; Jabar, 2026) that appropriate feedback during the learning process helps improve technical performance and accelerate the acquisition of motor skills in volleyball .

Based on the current results, it can be said that the external focus of attention strategy has effectively contributed to learning the smash skill and improving its technical performance among students of the college of Physical Education and Sports Sciences . This was achieved by directing learners attention toward the outcomes of the movement and its impact on the surrounding environment which led to an improvement in the quality of technical performance and an increase in the effectiveness of the learning process compared to the traditional teaching method used with the control group .

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Conclusions

The researcher concluded that the external focus of attention strategy effectively contributed to learning the smashing skill among second year students in the College of Physical Education and Sports Sciences as it led to an improvement in the technical performance level of the skill among the experimental group members . The results also showed that the experimental group outperformed the control group in the posttest of the technical performance of the smashing skill confirming the effectiveness of the external focus of attention strategy in improving the quality of technical performance and accelerating the learning process by directing learners attention toward the outcomes of the movement and its impact on the surrounding environment during performance .

Recommendations

The researcher recommends the necessity of adopting an external focus of attention strategy within the educational units for learning the skill of spiking in volleyball due to its positive impact on improving technical performance and accelerating the learning process . He also recommends directing learners attention toward the outcomes of movement and its impact on the surrounding environment instead of focusing on the details of body parts movements during performance as this plays a role in improving the quality of motor learning . The researcher also recommends conducting similar studies on different samples and age groups to verify the effectiveness of the external focus of attention strategy in learning other basic skills in volleyball and various sports as well as comparing this strategy with other modern motor learning strategies to identify the most effective ones in improving the technical performance of learners .

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Administrative creativity and its relationship to the future perspective in organizing local tournaments in the sub-federations of racket sports

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Abstract

The research aimed to develop t[2]wo scales: one for administrative creativity and another for future perspectives, for members of the sub-federations of racket sports. also aimed to identify the level of administrative creativity and future perspectives regarding the organization of local tournaments within these sub-federations, and to determine the relationship, contribution, and impact of administrative creativity on future perspectives for organizing local tournaments from the perspective of the sub-federations' members. The descriptive approach, employing correlational methods, was used on a randomly selected sample of 93 individuals, representing 72.093% of the original population of 129 members of the sub-federations of racket sports. These members were distributed across four federations (tennis, badminton, table tennis, and squash) and were continuing their administrative work within these federations for the 2023-2024 sports season. After selecting the two main research instruments, they were modified through field procedures and sequential statistical analyses on a sample of 30 individuals for statistical analysis, The resulting scales were developed into specialized measures for this research, The survey of the opinions of the main sample began at their workplace at their four sub-federations headquarters in the city of Baghdad for the period from Wednesday, September 6, 2023, until Thursday, October 26, 2023. After collecting the scores of each individual for each measure, the researcher verified that the results were processed using the Statistical Package for the Social Sciences (SPSS). The conclusions are that the members of the sub-federations for racket sports possess administrative creativity that helps them organize local tournaments in their four sports. The members of the sub-federations for racket sports also possess a future-oriented perspective that predicts the good organization of local tournaments in their four sports. Administrative creativity is linked to, contributes to, and influences the future-oriented perspective for organizing local tournaments in a positive and direct relationship from the point of view of the members of the sub-federations for racket sports. It is necessary to pay attention to improving the administrative creativity of the members of the sub-federations for racket sports continuously because of its influential and positive role in raising the level of the future-oriented perspective, which ensures administrative stability when organizing local tournaments in the future.

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Keywords: Administrative creativity, organizing local tournaments, future perspective, racket sports.

Introduction

"The importance of creativity stems from its role as a means of development, renewal, and innovation in finding new methods and solutions to existing problems in an innovative way that saves time, effort, and cost. The sum of creativity reflects the level of civilization humanity has reached. Without creativity and innovation, life would have remained in its primitive form" (Laheq, 2007, p. 13).

"Administrative creativity is a crucial factor for success and excellence in organizations, as it helps improve performance, increase productivity, and develop the services provided." (Rami, 2017, p. 65).

" Also, Administrative creativity is essential for any administrative institution, especially sports federations and clubs, due to its importance in benefiting the team. This makes creativity and excellence a competitive characteristic, as successful administrators must develop their abilities to contribute to solving problems." (Thamer & Saad, 2019, p. 122)"

"Administrative creativity is a key aspect of achieving success and excellence in the daily business environment. It significantly contributes to further innovation and development in various fields of work, and enhances productivity and efficiency." The diverse range of skills and practices encompasses administrative creativity, such as creative thinking, risk management, team organization, process development, and service delivery innovation. (Saad, 2018, p. 34) Administrative creativity includes several characteristics that contribute to business success and excellence, the most prominent of which are:

- Creative Thinking: Managerial creativity is characterized by the ability to think differently and innovatively to solve problems, and to use new and unconventional methods and tools to achieve goals.
- Adaptiveness: Managerial creativity possesses the ability to adapt to rapid changes in the work environment and to transform challenges into new opportunities for development and progress (Khaled, 2019, p. 77).
- Effective Management: Managerial creativity requires effective management and organizational skills, including organizing and directing teams toward achieving defined goals.
- Cooperation and Teamwork: Managerial creativity necessitates cooperation and teamwork among individuals and teams, and the exchange of ideas and experiences to find innovative and effective solutions.
- Excellence and Innovation: Managerial creativity relies on excellence and innovation in providing products and services, developing new processes, and innovating in management methods.
- Risk Management: Managerial creativity requires the ability to manage risks, make bold decisions, and experiment and test to achieve success. (Saeed, 2016, p. 83)

This is means that's the administrative creativity is "an important source of change and transformation in organizations, helping to enhance the ability to adapt to internal and

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external challenges and changes, and also helping to develop a work culture and stimulate innovation and creativity within organizations." (Mohammed, 2015, p. 152)

> It is illogical to describe administrative leadership as possessing a vision for the future when it is based on speculation that does not rely on numerical data about what will happen in the future. (Dess, 2007, p. 15)

"The performance of administrative structures has emerged within this framework, given its effective impact on improving performance and job satisfaction, and its primary focus on establishing and building trust between management and employees, motivating them, involving them in decision-making, and breaking down internal barriers between management and employees." (Saad, 2005, p. 212)

"The future perspective in management looks to the challenges and opportunities that institutions and organizations will face in the future, and depends on the future vision of those institutions and their ability to adapt to the rapid changes in the modern world." (Muhammad, 2019, p. 51) The characteristics of the future perspective are as follows:

- Development of Technology: Technological development is a key factor in shaping the future. Therefore, organizations must leverage and adapt to modern technologies to achieve excellence and future success.
- Digital Transformation: This requires organizations to transition from traditional methods to modern technologies for managing operations, improving productivity, and making business more efficient and effective.
- Sustainability: Sustainability is a major challenge facing organizations in the future. They must take measures to reduce negative environmental impacts and enhance social responsibility.
- Demographic Shift: Organizations must address rapid demographic shifts and keep pace with the needs of employees and customers from diverse age groups and cultural backgrounds.
- Cultural Diversity: Cultural diversity is a challenge facing organizations in the future. They must take measures to promote inclusivity, tolerance, and cooperation among individuals from different cultures. (Talal, 2019, p. 51)
- Continuous Learning: Organizations must engage in continuous learning and update their knowledge and skills to meet future needs.
- Creative thinking: Creative thinking is a key factor in shaping the future, and organizations must foster this type of thinking to achieve excellence and success.
- Collaboration and communication: Collaboration and communication are effective methods for achieving goals and future visions, and organizations must promote these values in the work environment.
- Creative leadership: Creative leadership plays a crucial role in shaping the future, and leaders must foster confidence in the future and motivate individuals to achieve outstanding results.

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❖ Maintaining flexibility: Organizations must maintain flexibility and adapt to the constant transformations and changes in the modern world. (Mohammed, 2016, p. 209)

The administrative structures of the sub-federations for racket sports are important institutions in hosting many local tournaments and actively contributing to their technical organization. Administrative creativity is considered complementary to the directions and aspirations of tournament management and fulfills the expected excellence in the future of sports administration work in these four administrative structures. The responsibility of the members of the sub-federations for racket sports has multifaceted dimensions at various levels in managing local tournaments, through their participation in drawing up the policy of future planning and the expected successes, which has become a necessary requirement for future projections that indicate the desired improvements for any organization that wants to succeed and progress away from speculation or improvisation. Through the academic researcher's work in sports management and her review of many available sources and research related to the specifics of the current research and her conducting many discussions through interviews with members of the sub-federations for racket sports, she noticed the need to delve into a study that would help raise the level of these administrative structures of the sub-federations for racket sports, which necessitates studying administrative creativity in organizing local tournaments. Given that it is one of the most important fundamental criteria in the future perspective.

In management, "a future perspective requires analyzing future challenges and opportunities, defining future goals and visions, developing effective strategies and action plans to achieve those goals, promoting innovation, creativity, and continuous learning, and enhancing trust, cooperation, and communication within the organization." (Nasser, 2018, p. 114)

"Sports federations, which are the entities responsible for developing any administrative work in any sport in any country, bear the responsibility for their respective teams in all areas." (Ismail and Taqa, 2018, p. 194)

Based on a critical analysis of the framework of previous literature, the research problem lies in attempting to answer the following questions:

- What is the level of administrative creativity in organizing local tournaments among members of the sub-federations for racket sports?
- What is the level of future-oriented perspective among members of the sub-federations for racket sports?
- What role does administrative creativity play in organizing local tournaments from a future-oriented perspective among members of the sub-federations for racket sports?

Therefore, this research aims to:

- Develop two scales: one for administrative creativity and another for future-oriented perspective, for members of the sub-federations for racket sports.
- Identify the level of administrative creativity from the perspective of members of the sub-federations for racket sports.

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- Identify the level of future-oriented perspective in organizing local tournaments from the perspective of members of the sub-federations for racket sports.
- Identify the relationship, contribution, and impact of administrative creativity on the future-oriented perspective in organizing local tournaments from the perspective of members of the sub-federations for racket sports.

Procedures

The descriptive research method is adopted, which is defined as "the method that describes a phenomenon according to a specific research plan that includes describing the phenomena, collecting facts and information about them, evaluating these phenomena in light of what they should be, and in light of more appropriate standards, and suggesting the steps that should be taken." (Magdi, 2019, p. 208)

The research population includes the members of the sub-federations for racket sports, totaling (129) individuals, naturally distributed across (4) federations for (tennis, badminton, table tennis, and squash), who continue their sports administration work in these formations for the (2023-2024) sports season. All of them were deliberately selected using a comprehensive enumeration method at a rate of (100%) to ensure their inclusion in the two phenomena addressed in the research problem, so that they could be treated as a single total sample that fulfills the required research objectives. From them, (6) individuals were randomly selected for the pilot sample, representing (4.651%) of their original population, and (30) individuals were also randomly selected for the statistical analysis sample for the two measurement instruments, representing (23.256%) of their original population. The remaining (93) individuals, representing (72.093%) of the original population, were selected for the application sample, as shown in Table (1):

Table 1. *shows the description of the research population members and their distribution across the three researc samples, along with their percentages*

Administrative Formations	Number of Governora	Members of Su Federations	Details of Individual Distribution		
			Explorator	Statistical Anal	Applicatio
Tennis Sub-Federatio	12	36	2	9	25
Badminton Sub-Federations	12	36	2	9	25
Table Tennis Sub-Federations	18	54	2	12	40
Squash Sub-Federatio	1	3	-	-	2
Total		129	6	30	93
Percentage of the Original Population		% 100	% 4.651	%23.256	%72.093

Tools

The Administrative Creativity Scale was used (Dailman, 2011, p. 167), which is contents 14 items, each with a five-point scale of statements and alternatives (strongly agree, agree, unsure, disagree, strongly disagree). The weighting of these alternatives is 5-1, with a

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total score ranging from 14 to 70 and a hypothetical mean of 42. This is a paper-and-pencil scale, where higher scores indicate better performance, as explained in Appendix (1).

The Futures Perspective Scale (Salah, 2011, p. 24) was also used. This scale comprises two dimensions of futures perspective, divided into 36 items. Each item consists of a three-point scale of statements and alternatives (strongly agree, sometimes agree, disagree). The total score ranges from 36 to 108, with a hypothetical mean of 42. This is also a paper-and-pencil scale, where higher scores indicate better performance.

Results

The two research scales have been modified to suit the target sample. The researcher modified the items of each scale and presented these modifications to (17) experts to obtain face and logical validity, with over (80%) of them agreeing with the revised scales.

Construct validity was also verified by applying the scales to a sample of (30) individuals for statistical analysis, using statistical significance to determine the discriminatory ability between the two extreme groups (27%) of this sample. Internal consistency was verified by calculating simple Pearson correlation coefficients. Furthermore, reliability was verified by processing the scores with Cronbach's alpha coefficient, which reached (0.877) for the Administrative Creativity Scale and (0.849) for the Future Perspective Scale at a significance level of (0.05) and (28) degrees of freedom. The normal distribution of the scores in the statistical analysis sample was also confirmed.

These procedures were implemented simultaneously and independently in all statistical analyses. The scale for administrative creativity in organizing local racket sports tournaments now consists of 14 items, modified to align with the specific requirements of this research, without deleting any items. The total score ranges from 14 to 70 points, with a hypothetical mean of 42. The future-time perspective scale now comprises two dimensions, distributed across 25 items, with a total score ranging from 25 to 75 points and a hypothetical mean of 50. This scale was modified after deleting 11 items, without any further modifications, as those items were deemed unsuitable for the planning and organizational nature of the sub-federations.

Furthermore, after finalizing the two scales, a survey was conducted with the main application sample of (93) individuals at their workplaces at the four-federation headquarters in Baghdad, from Wednesday, September 6, 2023, to Thursday, October 26, 2023.

After collecting each individual's score for each scale, the researcher processed the results using the Statistical Package for the Social Sciences (SPSS) for the following: percentage, mean, standard deviation, t-test for uncorrelated samples, simple correlation coefficient, Cronbach's alpha coefficient, one-sample t-test, and the rules of linear regression model.

Table 2. *shows the level of results of the application sample in the two scales compared to the hypothetical mean of each*

Scale Name	Number of Items	Total Scale Score	Hypothetical Mean	Arithmetic Mean	Standard Deviation	Difference Between Means	(t)	(Sig)	Significance

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Administrative Creativity	14	70	42	47.978	4.418	5.978	13.049	0.000	Significance
Future Perspective	25	75	50	53.344	6.572	3.344	4.907	0.000	Significance

n=93(t) is a function where (Sig) > (0.05) at a significance level of (0.05) and degrees of freedom of (92).

Table 3. *shows the results of the simple correlation coefficient and linear regression between the scores of individuals on the two scales*

Influential Factor	Affected	Correlation Coefficient (R)	Linear Regressio Coefficient R^2 (Coefficient of Determination)	Contribution Ra	Standard Error of Estimation
Administrative Creativity	Future Perspective	0.926	0.858	0.857	2.487

Table 4. *shows the results of the (F) test to examine the goodness of fit of the linear regression model*

Influential Factor	Affecte	Contrast	Sum of Squares	Degrees of Freedom	Mean Square	(F)	(Sig)	Significance
Administrative Creativity	Future Perspective	Regression	3409.927	1	3409.927	551.099	0.000	Significance
		Errors	563.063	91	6.188			

n = 93 The value of (F) is significant if the value of the (Sig) score is > (0.05) * Significance level(0.05)

Table 5. *Shows the results of the fixed term and slope (effect) estimates for the linear regression values*

Affected	Variables	β	Standard Err	(t)	(Sig)	Significanc
Future Perspectiv	Fixed Term	-12.767	2.828	4.514	0.000	Significance
	Managerial Creativ	1.378	0.059	23.476	0.000	Significance

The value of (t) is significant if the score of (Sig) > (0.05) at the significance level of.(0.05)

Discussion

The level of the two phenomena has results the in Table (2) showed that the opinions of the research sample showed that both administrative creativity for organizing local tournaments for racket games and the future Perspective are available at varying levels among members of the sub-federations for racket games. The results of Tables (3), (4) and (5) of the linear regression model show a significant positive relationship for the good alignment of administrative creativity for organizing local tournaments for racket games and the future Perspective, and that this relationship contributes a significant effect, while the rest of the contribution is due to other random factors that were not researched.

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Researcher attributes the emergence of these results, with the level and influential relationship of the role of administrative creativity in the future perspective, to the fact that continuous development and change represents one of the most important goals of the future perspective in management. It is important for management to have the ability to adapt to external variables and develop itself creatively to meet the needs of the tournaments it organizes by innovating what improves its processes to better meet the needs of these local tournaments by adopting new technologies and using them effectively.

These results, according to the opinions of the research sample, were a result of the continuous improvement of its operations and services, through the periodic evaluation of the performance of these sub-federations and the identification of points that can be improved and developed, in order to achieve sustainability in its operations and work, through the adoption of practices that are consistent with the concept of sustainable development, which achieves social, environmental and economic sustainability, and achieving effective leadership and developing members of them to be leaders capable of achieving the desired goals and motivating those in charge of managing the tournaments to achieve the desired results, and good cooperation and partnerships with other companies and institutions that support one of the most important goals of the future perspective in management to enhance competitiveness.

To develop work resources these federations sought to provide an attractive and motivating work environment for their employees, and to develop their capabilities and train them in the skills necessary to achieve the goals of managing local tournaments, which gives the implication of these results that the higher the level of administrative creativity, the higher the level of future perspective, and in direct proportion to this increase.

"Administrative creativity is an invitation to renewal and development, a call to be sensitive to the problems facing managers in their workplaces, an exploration of available opportunities for development and improvement, a loud scream to abandon stagnation and welcome renewal that contributes to seeing things in a new light and with a holistic perspective, and a declaration that connects things to each other and reconciles them in an effort to produce new achievements that launch institutions." (Muhammad, 2006, p. 18)

“The creative person is the one who is satisfied with a small amount of information when working on any new project, due to his ability to simplify and organize his ideas and work according to well-thought-out principles. The analytical individual is described as the one who can take an idea or a project and then determine its details.” (Saud, 2006, p. 118)

"The modern effective management of the future work of sports federations has become important and necessary. Therefore, every sports federation must allocate an appropriate amount of time from its work for dialogue and consultation within the federation's premises or with other people outside the federation's system who possess experience and knowledge of the game and administrative work." (Omar and Huda, 2021, p. 10)

"Administrative creativity helps in the interaction of a number of abilities, aptitudes and personal characteristics which, if the appropriate environment is found, lead to original, useful and new production that contributes to the progress and development of human life in multiple fields." (Jamal, 2009, p. 9)

"The need for administrative creativity in institutions has become an urgent necessity in light of changing and evolving circumstances, especially for sports institutions, in order for them to rise and develop. Management scholars agree that those responsible for managing

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modern administrative institutions must be keen on improving and developing the capabilities of their employees." (Abdullah, 2022, p. 4)

"It can be said that administrative creativity plays a crucial role in the future, as it helps achieve significant transformations in administrative and institutional processes, thus enhancing opportunities for success and excellence in the market, helping in the continuous development of products and services, and providing new solutions to current and future problems." (Abdul Rahman, 2017, p.

Furthermore, "a person with a positive future outlook can accomplish difficult tasks, but this is only possible with the motivation to persevere in completing those tasks through learning." (peetsma, 2000, p. 177)

It is also stated that "creativity is one of the essential functions that management should focus on, setting short-term and long-term goals for it, and taking responsibility for providing opportunities, creating a suitable environment, and offering incentives and recognition to those who succeed in it. Management must also learn how to integrate creative talent into the organization and guide it in a specific direction." (Abdullah, 2005, p. 11)

"For future prospects, management must strive to move away from the traditional approach to management and think creatively and boldly, utilizing modern technology and innovations in business management. Focusing on quality should be a primary objective of the future outlook in management, through improving the quality of products and services and enhancing production and delivery processes. This can be achieved by adopting and effectively implementing international quality standards." (Mohammed Abdul Hakim, 2019, p. 85)

"For a future-oriented management perspective, the aim should be to achieve sustainability and social responsibility in its operations, provide a healthy and safe working environment, reduce negative environmental impact, support local communities and improve their lives. Communication and transparency should be key objectives for a future-oriented management perspective, as management should communicate effectively with company employees, customers, partners and the local community, and provide transparent and honest information about business, results and developments." (Mohamed Salah, 2019, p. 11)

Furthermore, "Management must leverage modern technology and innovations from a future-oriented perspective to improve business processes, achieve sustainability and competitiveness, and develop new products and services that meet customer needs. Management must also prepare for digital transformation and utilize artificial intelligence, machine learning, and big data technologies to enhance business processes and achieve sustainability and competitiveness." (Mohamed El-Erian, 2018, p. 121)

"To achieve the goals of a future-oriented perspective, management must move beyond mere profitability and consider social, environmental, and economic problems, developing comprehensive solutions to these challenges." (Fatima Al-Zahra, 2018)

Additionally, "Achieving the goals of a future-oriented perspective requires effective management, meticulous planning, and outstanding execution. Vision, creativity, and bold thinking can contribute to achieving these objectives." (Abdul Rahman, 2017, p. 54)

"One of the responsibilities of the administrative leader is to create a positive social environment that helps creativity and innovation within the organization. The leader who makes subordinates feel important at work raises their morale and self-confidence, which motivates them to exert more effort and think, and then progress and innovate." (Falah and Ali, 2021: p. 127).

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Conclusions

- The members of the sub-federations for racket sports possess administrative creativity that helps them organize local tournaments in their four sports. They also have a forward-looking perspective that informs them about the successful organization of these tournaments.
- From the perspective of the sub-federations' members, administrative creativity is directly and positively linked to, and contributes to, a forward-looking perspective on organizing local tournaments.
- It is essential to continuously enhance the administrative creativity of the sub-federations' members, as it plays a significant and positive role in raising their forward-looking perspective, which ensures administrative stability when organizing local tournaments in the future.

Appendix

Appendix 1. *shows the items of the Administrative Creativity Scale as received from its source and after modification*

Item statements after modification	#	Item statements before modification
The sub-federation is able to generate a large number of alternatives, ideas, or uses when organizing local tournaments.	1	Generating a large number of alternatives, ideas, or uses when responding to a specific stimulus.
The sub-federation persuades others while dealing with them through skills and a good understanding of information related to organizing local tournaments.	2	Persuading others while dealing with them through skills and a good understanding of all relevant information.
The sub-federation is able to change the mindset of the local tournament management by changing the situation.	3	Changing the mindset of the middle management by changing the situation.
The sub-federation is able to adapt to and absorb new circumstances, variables, and situations in the form of atypical responses and participation during tournament organization.	4	Adapting to and absorbing new circumstances, variables, and situations in the form of atypical responses and participation.
The sub-federation is able to see multiple problems in a single situation during tournament organization.	5	Seeing multiple problems in a single situation.
The sub-federation anticipates problems before they occur and prepares to address them.	6	Anticipate problems before they occur and prepare to address them.
The sub-federation is able to develop and cultivate something new or different.	7	Develop and cultivate something new or different.
The sub-federation is able to find new ideas and alternatives to solve the problem they face in organizing the tournament.	8	Find new ideas and alternatives to solve the problem they face in the middle school.
The sub-federation adopts new ideas and methods for organizing tournaments and is prepared to bear the risks and responsibilities that result from them.	9	Adopt new ideas and methods for performing the work and be prepared to bear the risks and responsibilities that result from them.

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The sub-federation adopts the application of new methods in organizing the tournament.	10	Apply new methods for performing the work.
The sub-federation is able to simplify and organize ideas when faced with a problem during tournament organization.	11	Simplify and organize ideas when faced with a problem.
The sub-federation is able to evaluate weaknesses and unsuccessful efforts in organizing local tournaments.	12	Evaluate weaknesses and unsuccessful efforts in the middle school.
The sub-federation relies on dealing with complex systems and adapting them to the realities of the work.	13	Deal with complex systems and adapt them to the realities of the work.
Members of the sub-federation are able to express their opinions appropriately and correctly.	14	Expressing their opinions appropriately and correctly.

Appendix 2. *Future Perspective Scale*

#	Item Statements	Completely Apply	Sometimes Apply	Not Apply
	Dimension One: Motivational Aspect			
1	I identify my present and future needs and strive to achieve them.			
2	I develop methods for addressing my future problems to reach solutions.			
3	My colleagues' opinions play an important role in my future life.			
4	I find happiness in helping others.			
5	I feel happy when I have positive relationships with others.			
6	I strive to solve problems that require solutions that will benefit me in the future.			
7	I feel some anxiety when I don't complete my tasks on time.			
8	I strive for excellence in my work, even if it takes a long time.			
9	Closeness to God makes me happy in the present and future.			
10	For me, securing my future lies in accomplishing valuable tasks.			
11	I strive to be a distinguished figure in my future career.			
12	I strive to accomplish challenging tasks that will set me apart from others in the future.			
13	I strive to complete my tasks to achieve a better economic life in the future.			
14	Completing one task motivates me to accomplish another.			
	Second Dimension: The Cognitive Aspect			
15	I dedicate most of my time to acquiring knowledge.			
16	I feel happy when I obtain an academic degree.			
17	I find pleasure in frequenting sources of knowledge.			
18	I am convinced that success does not come by luck.			

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19	I keep many books in my personal library, both at work and at home.
20	I strive to accomplish tasks I have not yet completed.
21	I am convinced that acquiring knowledge never stops as long as I live.
22	I take my time when asked to answer any question or give my opinion on a topic.
23	I endure any difficulties in order to obtain any new information that will benefit me in the future.
24	I compete with my colleagues to acquire knowledge and complete tasks.
25	I persevere in completing tasks that will benefit me in the future, regardless of my circumstances.

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Attitudes of Physical Education Teachers Toward Employing Artificial Intelligence in Physical Education Lessons

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Abstract

This research aims to identify the attitudes of physical education teachers towards the use of artificial intelligence in physical education lessons, as well as their acceptance of using AI in teaching practices and the factors influencing these attitudes. A descriptive survey methodology was used with a sample of 1,483 teachers, the data was collected from public schools in Egypt using a questionnaire covering three main areas: teachers' attitudes toward artificial intelligence, their acceptance of its use in practice, and the factors influencing this. The results showed highly positive attitudes toward integrating artificial intelligence, There was strong acceptance of its use in lessons, and no statistically significant differences were found according to gender or years of service. The study recommends providing practical training programs, ensuring the availability of necessary hardware and software, and encouraging the exchange of experiences to maximize the benefits of artificial intelligence in physical education.

Keywords: Attitudes, Artificial Intelligence, Physical Education Lessons.

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Introduction

Education in the modern era is witnessing an accelerated transformation driven by technological developments, and artificial intelligence (AI) emerging as one of the leading tools that affect teaching methods and learning styles. AI applications contribute to charitable the quality of education by supporting lesson planning, Applications of AI participate to improving the quality of education by supporting lesson planning, providing immediate feedback, and personalizing learning experiences according to students' needs, in addition to promote teachers' efficiency in classroom management and the development of their instructional practices. Technological development over recent decades has brought about major changes across various aspects of life, including the educational field (A. Syafruddin, 2023). The integration of AI into the learning process is considered one of the innovations that has gained widespread attention, as AI offers significant opportunities to support educational activities in terms of content delivery, personalized learning, and the assessment of students' achievements (Hooda et al., 2022).

However, the process of adopting this technology still faces many challenges, especially in the field of physical education, which is essentially based on motor activities that are difficult to replace or simulate through digital technologies (Almusawi et al., 2021).

AI exercise are through the most advanced technologies at the present time, as they are now widely used within institutions, and their spread has clearly accelerated in the field of education, The concept of AI refers to a set of computer technologies eligible of performing tasks that usually require human qualification, such as pattern difference and aural version, This technology relies on affecting human thought processes through computer systems that can infer relationships, make decisions, and perform tasks in a mode similar to human behavior(Mokhtar, 2016; Zerouki & Falta, 2020).

Physical education plays a pivotal role in support students' health and holistic development, and has become an main component of educational curricula globally, However, transport goodness classes face diverse challenges, thorough fixed resources, uneven curriculum performance, and certain physical education request in terms of space, safety, and the different of student levels, underscoring the need for innovative and development educational solutions. (Strotmeyer, Kehne, & Herrmann, 2021; Landi, Walton-Fisette, & Sutherland, 2021).

AI has grown as a chance resource for process these challenges by supporting educators and encourage personalized learning climate, across a wide range of educational settings, the blend of AI has shown great word in charitable teaching and learning outcomes. This is completed by support AI-based tools, Educators were able to improve students' academic performance, as well as boost their motivation and connection in learning. moreover, AI technologies provided opportunities to monitor each student's progress individually and provide personalized feedback, thus enhancing the overall quality of education. (Holmes, Bialik, & Fadel, 2023; Roll & Wylie, 2016).

Integrating AI technologies into physical education requires a thorough understanding of teachers' attitudes and trends toward this technology, as teachers play a

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pivotal role in ensuring the effectiveness of its applications in classrooms (Ng, Lee, Tan, Hu, Downie, & Chu, 2023; Lv, Jiang, & Jiang, 2022; Pandey & Mishra, 2024).

Despite the great strength of AI in providing personalized returns and tracking student progress, teachers confirm that these tools often lack the growing of the social and cooperating portion of learning, which are essential elements in physical education classes, and from this standpoint, teachers suggest that Integrating artificial intelligence is accompanied by experimental and flexible teaching methods that allow rousing transaction, promote motivation, and developing students' physical and social skills (Kollwitz, 2023; Reddy, 2020; Cao, Lei, Lin, & Xiang, 2022).

By introducing a new form of digital conversation, personal skills programming, and adventure sports learning environments, artificial intelligence (AI) is helping to transform physical education. AI technologies allow for the induction of request training programs that are suited to each student's needs, beneficent learning effect and physical showing They also keep an eye on students' general health and offer real-time feedback and efficient training plan changes. (Cao & Yu, 2025; Zhou et al., 2024).

Through reacting training environments that enable the practice of difficult athletic skills in regulated, actual conditions, The blend of virtual reality technologies with artificial intelligence grow the learning experience in physical education through reactive training environments, allowing the practice of complex athletic skills in controlled, realistic conditions. then, AI tools help to exactly assess athletic performance, participate to the design of more effective training plans. (Zhang, 2021; Deng et al., 2025)

In addition, integrating AI with play-based learning methods contributes to student motivation and enhanced engagement, while systems reliability, accuracy, student data protection, and teacher professional development remain critical factors for application success and improved learning outcomes (Hussein et al., 2025; Francisco, 2025).

Despite the increasing development in applications of artificial intelligence in education, and what the literature has proven of its potential to support learning and improve student performance assessment, its use in physical education lessons is still limited due to the nature of motor activity and social interaction, which requires direct supervision and high organizational skills. The success of integrating these technologies depends on the attitudes of teachers and their willingness to use them effectively, while the actual attitudes have not been adequately measured, which leaves a knowledge gap in understanding the extent of their acceptance of the technology, the potential obstacles, and the extent of its impact on developing teaching methods and improving the quality of education in this field. From this standpoint, the research aims to identify the attitudes of male and female physical education teachers towards employing artificial intelligence in the lesson, measure the extent of their acceptance of its use in their teaching practices, and identify the factors influencing these trends, while answering questions related to the differences according to the variables. Gender and years of service. The importance of the study is to clarify these trends, fill the research gap, provide a knowledge base for researchers, and benefit decision-makers and curriculum developers in activating intelligence

Methodology

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Sample design

The sample was selected using a random sampling method, with a primary sample size of 1,483 teachers' physical education in the Arab Republic of Egypt.

A pilot study was conducted on a separate group of 40 teachers outside the main sample to verify the scientific characteristics and validity of the research instrument. Table 1 presents the frequencies and percentages of the sample members according to the study variables.

Table 1. *Demographic characteristics of the participants Demographics Values, n (%)*

characteristics	Category	Frequencies	%
Gender	Male	739	49.83
	female	744	50.17
Years of service	> 5	479	32.30
	5-10	480	32.37
	< 10	524	35.33
Total		1483	100

Research Design

A descriptive survey The descriptive survey method was used because it is suitable for the nature of the research, as it seeks to describe and analyze the attitudes of male and female teachers, reveal their degree of acceptance of the use of artificial intelligence tools, and identify the factors affecting those attitudes.

Research Instrument

A questionnaire was constructed as the main tool for data collection. It was prepared in light of the research objectives and a review of relevant literature and previous studies, and it adopted a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), and consisted of three main domains as follows:

First Domain: Physical Education Teachers' Attitudes Towards the Use of Artificial Intelligence (7 items)

Second Domain: Teachers' Acceptance of the Use of Artificial Intelligence in Teaching Practice (7 items)

Third Domain: Factors influencing the attitudes of physical education teachers towards the use of artificial intelligence (7 items)

Validity of the Research Instrument

Content Validity

To ensure the validity of the instrument, the questionnaire in its initial form was presented to a group of expert reviewers specializing in the fields of physical education,

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educational technology, and measurement and evaluation. The experts were asked to provide feedback regarding:

- The suitability of the paragraphs to the research objectives.

- The accuracy of the language.

- The clarity of the expressions.

Based on the reviewers' comments, some paragraphs were revised, and others were deleted or merged, until the agreement rate among the reviewers reached over 90%, indicating the validity of the content.

Internal Consistency Validity

The internal consistency validity was calculated by computing the correlation coefficients between each item and the total score of the domain to which it belongs (i.e., the relationship between each item's score and the total score of the items within the same domain).

Table 2. *Spearman Correlation Coefficients Between Each Item and the Total Score of Its Corresponding Domain*

N	First Domain		N	Second Domain		N	Third Domain	
	spearman	sig		spearman	Sig		spearman	Sig
1	**0.907	0.00	1	**0.737	0.00	1	**0.927	0.00
2	**0.857	0.00	2	**0.672	0.00	2	**0.868	0.00
3	**0.832	0.00	3	**0.641	0.00	3	**0.793	0.00
4	**0.879	0.00	4	**0.670	0.00	4	**0.798	0.00
5	**0.791	0.00	5	**0.746	0.00	5	**0.738	0.00
6	**0.822	0.00	6	**0.750	0.00	6	**0.834	0.00
7	**0.849	0.00	7	**0.816	0.00	7	**0.769	0.00

Table 2 shows strong, positive and statistically significant correlations at the ($p < 0.01$) level between the questionnaire statements and the total score of the axis, indicating a high level of reliability and that the instrument enjoys a good degree of internal consistency. These results also confirm the construct validity and suitability of the instrument for use in measurement within the context of the study.

Reliability

The reliability of the study instrument was assessed through the test-retest method, where the questionnaire was reapplied at a time interval of 15 days to a random sample of (40) participants from the original study population, excluding the members of the basic research sample, in order to verify the reliability of the instrument.

Table 3. *The arithmetic mean, standard deviation for the application and reapplication, and the correlation coefficient (reliability) for the questionnaire domains. n=40*

domain	ICC	Sig 95%	KAPPA	Sig
first	0.998	0.997 – 0.999	0.940	**0.00

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second	0.985	0.971 – 0.992	0.914	**0.00
Third	0.983	0.968 – 0.991	0.933	**0.00

The results showed that the correlation coefficient (ICC) values for all axes were high, ranging between 0.983 and 0.998, with a 95% confidence interval, indicating the reliability of the questionnaire. Cohen's Kappa coefficients also showed A high level of agreement was observed between the initial and subsequent administrations, ranging from 0.914 to 0.940, all of which were statistically significant ($p < 0.001$). These results indicate that the questionnaire is highly reliable and an accurate and applicable measurement tool.

Results and Discussion

Table 4. *First Domain: Physical Education Teachers' Attitudes toward the Use of Artificial Intelligence (N = 1483)*

N	Statements	mean	SD	χ^2	sig
1.	I believe that artificial intelligence (AI) enhances the quality of physical education lessons.	4.31	1.00	1641.04	P<0.00
2.	I think that using AI promotes students' learning.	4.04	1.20	1169.63	P<0.00
3.	I welcome the implementation of AI technologies in my lessons.	3.75	1.56	991.23	P<0.00
4.	I am convinced that AI develops modern teaching methods.	3.97	1.16	1052.91	P<0.00
5.	I prefer integrating AI tools into physical education activities.	4.48	1.03	2859.01	P<0.00
6.	I believe that AI facilitates the planning of physical education lessons.	4.41	1.10	2341.09	P<0.00
7.	I believe that AI eases the assessment of students' performance in physical education lessons.	4.32	1.18	2311.83	P<0.00

The results indicate that there are high positive orientation through physical education teachers because of spend AI in the lesson, as the arithmetical means of the different elements showed that they extend between 3.75 and 4.48. This reflects teachers' conviction in the role of artificial intelligence in supporting the quality of physical education lessons, grow student learning, improve modern teaching methods, and assist planning and showing evaluation. These findings are regular with those of Tan, Ceylan, & Tür (2023). The study particular that teachers show positive attitudes toward the use of AI in education, think an openness to the use of new technologies in the educational process. These findings also align with the study by Banaz & Maden (2024), which confirmed that teachers' attitudes toward AI applications tend to be positive.

The results showed a growing trend through teachers to merge AI tools into physical education efficacy and use them to facilitate lesson planning and student performance assessment, consider a clear understanding of the practical advantage of these technologies. These findings support the observations of Seyre, Yıldız, Emeşi, Şahin, & Türmen (2024), The findings suggest that AI can effectively contribute to content creation, activity preparation, data analysis, and student progress observation. These results are consistent

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with those of İç & İç (2024), The high level of knowledge of AI is linked to positive attitudes towards its use in education, which explains the high content shown by physical education teachers about the importance of AI and its role in improving their teaching practices.

Furthermore , these findings are in line with Syafruddin & Ikadarny (2025), This showed that physical education teachers' understanding of AI techniques is still uneven, but they recognize its great potential in improving the quality of learning, especially in the accurate analysis of students' movements and providing prompt feedback, which contemplate their academic and positive readiness to use this technology in the educational environment.

Table 5. *Second Domain: Teachers Acceptance of Using Artificial Intelligence in Teaching Practice (N = 1483)*

N	Statements	mean	SD	χ^2	sig
1.	I can use artificial intelligence (AI) easily during teaching.	4.57	0.93	2869.36	P<0.00
2.	I accept trying new tools that rely on AI.	4.65	0.69	2001.80	P<0.00
3.	I approach smart technologies in physical education lessons positively.	4.48	0.99	2419.62	P<0.00
4.	I adapt quickly to any AI-based tool.	4.11	1.05	1205.01	P<0.00
5.	I benefit from AI applications in teaching sports skills.	3.97	1.30	970.05	P<0.00
6.	I integrate AI technologies into lesson activities without difficulty.	4.63	0.88	1554.16	P<0.00
7.	I implement AI-supported teaching practices with confidence.	4.54	0.98	2041.64	P<0.00

The results indicate that physical education teachers demonstrate a high degree of receptiveness to the use of artificial intelligence in teaching practice, with the arithmetic mean scores for the various elements showing high values ranging between 3.97 and 4.65. This reflects their ease of use of smart technologies, their ability to adapt to new tools, and their confidence in implementing AI-supported teaching practices.

These findings are consistent with Wang & Wang (2024), The use of artificial intelligence in education depends largely on teachers' acceptance of smart technologies, and affects the extent to which they integrate new educational tools into lesson activities, thus enhancing teaching effectiveness and increasing the quality of student learning ,Similarly, Raza & Farooq (2025) confirmed a positive relationship between the ease of using smart tools and teachers' readiness to try and adopt new technologies.

The results also indicate that the ability to quickly adapt to and utilize smart tools in explaining mathematical skills is a significant factor in enhancing teachers' acceptance of technology. The results suggest that the ability to quickly adapt to and utilize smart tools in explaining mathematical skills promotes teachers' acceptance of artificial intelligence, this aligns with Cabero Almenara et al. (2024), who emphasized that positive attitudes toward the benefits of technology increase teachers' readiness to use smart applications in the classroom. Similarly, Gaafar (2020) Having technical expertise enhances individuals' readiness to adopt and effectively use artificial intelligence tools, and artificial intelligence contributes to improving efficiency and facilitating planning and decision-making processes.

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Table 6. *Third Domain: Factors Affecting Physical Education Teachers' Attitudes toward the Use of Artificial Intelligence (N = 1483)*

N	Statements	mean	SD	χ^2	sig
1.	My technical experience affects my willingness to use artificial intelligence (AI).	4.48	1.06	2870.34	P<0.00
2.	The availability of appropriate training encourages me to use AI in teaching.	4.64	0.87	2292.74	P<0.00
3.	The availability of devices and technologies at school facilitates the use of AI in physical education lessons.	4.70	0.65	2289.58	P<0.00
4.	The time available during class influences my ability to use AI applications.	4.57	0.92	1976.56	P<0.00
5.	My belief in the benefits of AI increases my willingness to employ it in teaching.	4.62	0.93	3539.71	P<0.00
6.	Support from school administration encourages me to use AI in physical education lessons.	4.61	0.55	1619.34	P<0.00
7.	The nature of the physical education lesson (outdoor field or indoor gym) affects the feasibility of using AI applications.	4.65	0.49	933.01	P<0.00

The results indicate that several factors influence PE teachers' attitudes using artificial intelligence in teaching, with the arithmetical means of the various elements showing high values ranging between 4.48 and 4.70, reflecting the importance of technical expertise, the availability of exercise, the availability of tools, and executive support., The nature of the lesson fosters teachers' desire to use artificial intelligence. This aligns with research findings showing that AI not only serves as a support tool but also explain an integrated learning environment that enhances teacher effectiveness, improves planning and assessment, and provides through feedback to students, which positively impacts their learning and performance development. (Bofill-Herrero et al., 2025; Solamillo, 2025).

It was hereafter discovered that the difference of technical skills and experience in using technology growing their skills to take on artificial intelligence tools in lessons (Hwang, Xie, Wah, & Gaševi, 2020), and that the availability of local training and support increases the eligibility of using these details and hearten their integration into their educational pursuit (Khosravi et al., 2022).

The findings of Gaafar et al. (2024) moreover point out that the quality of the work environment and institutional support affect teachers' performance and readiness to take on new methods and technologies. This can be attached to teachers' desire to use smart tools and AI in PE lessons, as assistance professional environment grow their acceptance of change and adoption of innovative teaching way.

These results also align with Alqahtani (2024), who advanced that ease of use of artificial intelligence, and digital skills during teachers' growth their admission of new technologies in education, thus promote the blend of artificial intelligence into classroom exercise.

Finally, Raza & Farooq (2025) Which particular that the availability of digital tools and convenient infrastructure in schools clearly contributes to heartening teachers to anticipate AI in lesson planning, creating educational content, and developing modern

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teaching methods, and perfection of student engagement and performance, highlighting the role of technical, knowledge-based, and common support in promote AI blend in physical education teaching.

Physical Education Teachers' Attitudes toward the Use of Artificial Intelligence in Physical Education Lessons According to Gender and Years of Service

Table 7. *Physical Education Teachers' Attitudes toward the Use of Artificial Intelligence in Physical Education Lessons by Gender*

Domains	GENDER	N	mean	SD	df	T	Sig
First Domain	Male	739	4.19	0.65	1481	0.47	0.639
	Female	744	4.18	0.65			
Second Domain	Male	739	4.41	0.65	1481	0.69	0.489
	Female	744	4.43	0.62			
Third Domain	Male	739	4.59	0.55	1481	1.17	0.244
	Female	744	4.62	0.52			

The table shows that there are no statistically significant differences between male and female physical education teachers in their attitudes toward using artificial intelligence (AI) in physical education lessons. This suggests that affect regarding recent educational technologies are not significantly influenced by a person's gender. This outcome can be light by the quick digital transition in school, where both genders now have greater access to AI and digital technology, which has led to a convergence of views and awareness levels.

These results are in line with those of Ayanwale et al. (2022) and Kim & Kwon (2023), who found that regular training and digital competency have a greater impact on views about AI than demographic factors like gender. then, Chiu et al. (2024) observed that gender-related difference in the adoption of AI technology is lessened by shared educational practice and institutional support.

Table 8. *Physical Education Teachers' Attitudes toward the Use of Artificial Intelligence in Physical Education Lessons by Years of Experience*

Domains	Years of service	N	mean	SD	F	Sig
First Domain	> 5	479	4.20	0.65		
	5-10	480	4.19	0.62	0.674	0.510
	< 10	524	4.15	0.67		
Second Domain	> 5	479	4.43	0.66		
	5-10	480	4.40	0.62	0.413	0.662
	< 10	524	4.43	0.64		
Third Domain	> 5	479	4.62	0.57		
	5-10	480	4.60	0.51	0.202	0.817
	< 10	524	4.60	0.53		

The findings elucidate those years of service had no statistically considerable impact on physical education teachers' attitudes about the use of AI. This suggest that the degree of approval or rejection of AI in education is not always correlated with the duration

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of professional experience. The fact that artificial intelligence is a relatively new technology helps to explain this. This stratify with his research findings. According to Fernández-Batanero et al. (2022), digital skills need planned and ongoing training rather than developing naturally via years of experience. According to Demchenko et al. (2021), prospects for utilizing artificial intelligence are identical for novice and seasoned educators due to a lack of institutional support and infrastructure. According to Gaafar et al. (2025), institutional communion and supportive partnerships provide instructors with the resources and training they require to progress in their careers. The findings also showed that when teachers have sufficient resources and a supportive environment, they are more prepared to adopt new tools and technology in the classroom, such as smart applications. This improves student learning and class results. It demonstrates the significance of the institutional climate and outstanding support in encouraging the adoption of innovation and technology in the classroom.

Conclusions

- Physical education teachers' attitudes towards integrating artificial intelligence into lessons are positive and reflect their awareness of its benefits in improving the quality of education and developing teaching methods.

- Teachers' acceptance of employing artificial intelligence tools in teaching practice is high, with ease of use, rapid adaptation, and confidence in applying technology-supported practices.

- There are no statistically significant differences in attitudes based on gender or years of service, indicating a uniformity of attitudes towards the use of artificial intelligence among teachers.

- Providing a supportive learning environment equipped with appropriate resources that promotes the adoption of artificial intelligence tools within the classroom, thereby improving student learning and the quality of lesson outcomes.

Recommendations

- Encouraging the gradual integration of AI tools into physical education lessons in a manner that is appropriate to the level of expertise of teachers and the needs of students.

- Providing practical training programs for teachers to enhance their technical skills and increase their confidence in using AI.

- Providing essential hardware and software within schools to ensure the easy application of artificial intelligence during lessons.

- Strengthen - Strengthening the role of school administration in providing technical and logistical support to teachers to encourage the continued use of AI.

- Raise teachers' awareness of the benefits of artificial intelligence in developing teaching methods and improving student performance.

- Encouraging the exchange of experiences among teachers who have successfully used artificial intelligence to disseminate effective practices.

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- Evaluating the effectiveness of using artificial intelligence to improve the quality of teaching and learning.

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Impact of the Flipped Learning Strategy on Long Jump Skill Learning Performance in Physical Education and Sport Sciences Students

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Abstract

The present study aimed to investigate the effect of the flipped learning strategy on improving long jump learning performance among students of the College of Physical Education and Sport Sciences. An experimental research design based on equivalent groups with pre- and post-testing was employed. The study sample consisted of 30 first-year students who were randomly assigned into an experimental group (n = 15), which received instruction using the flipped learning strategy, and a control group (n = 15), which followed the traditional teaching method. The instructional program was implemented over four weeks, comprising eight educational units with a duration of 90 minutes per session. Long jump learning performance was evaluated using a technical skill assessment form covering the main performance phases, including approach, take-off, flight, and landing. The results were analyzed using descriptive statistics and t-tests for dependent and independent samples at a significance level of ($p \leq 0.05$). The findings revealed significant improvements in both groups, with superior learning performance observed in favor of the experimental group. The flipped learning strategy enhanced students' engagement, provided prior cognitive preparation, and increased effective practice time, which contributed to improved motor skill acquisition. The study concludes that integrating flipped learning into physical education instruction represents an effective pedagogical approach for enhancing athletic skill learning outcomes among university students.

Keywords: motor skills, learning, physical education and training, students, flipped learning

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Introduction

The rapid evolution of teaching and learning technologies has also had a transformative impact on pedagogical strategies in physical education such that broadening opportunities for active participation, skill retention, and transfer have shifted learning contexts from teacher-driven paradigms to learner-focused frameworks. Modern teaching techniques are designed to help learners make the most out of study opportunities—integrating digital technologies enables students to connect with learning outside of schools. A currently popular approach is the flipped learning model, which alters traditional teaching roles by moving theory–based instruction out of the classroom and devoting class time to hands-on application with performance improvement.

Deep physical education skills learning takes generally a lot of practice time, continuous feedback, and active learner involvement. Motor practice has been limited during higher education courses by traditional teaching methodologies that often rely too heavily on instructional explanation. To overcome these limitations, the flipped learning model allows students to receive instructional coverage from educational material preview outside of class, transferring practical sessions to focus on motor execution and corrective feedback (Bergmann & Sams, 2023; Bishop & Verleger, 2013).

Previous educational research has demonstrated that flipped learning enhances student motivation, autonomy, and performance outcomes across various learning contexts. Studies also confirmed its effectiveness in improving psychomotor skills through increased engagement and individualized learning pacing (O'Flaherty & Phillips, 2015; Al-Maroof & Al-Emran, 2021). Moreover, integrating digital learning environments contributes to deeper understanding and better retention of motor skills in sports education settings (Chen et al., 2014; Waleed Abdulkareem & Sattar Jabbar, 2025).

Learning motor skills in athletic events such as the long jump is largely dependent on the coupling of biomechanics that relate to speed, strength, balance, and timing. This means that if we want the learner to properly acquire the different phases of movement—approach, takeoff, flight & landing—effective teaching strategies become paramount. Modern motor learning theory advocates that interpersonal engagement of the learner in practice and feedback-based correction are critical requirements for mastering a skill (Schmidt & Lee, 2025; Abdulghani et al., 2025).

The latest recent studies show movement education needs to be done through blended and tech-supported models. This flipped learning approach, in which theory and visual demonstrations were delivered to students before the practice sessions, has been found useful to prepare them cognitively and improve their procedural execution during class activities (Abeysekera & Dawson, 2015). As mentioned in research (Gilboy et al., 2015; Hassan & Abdulkareem, 2026), despite being newer, the participants that were exposed through flipped instruction had higher levels of engagement and outperformed traditional instructional methods.

In addition, researchers from physical education have emphasized that more practical time spent in lessons promotes neuromuscular adaptation and the development of motor coordination (Everett et al., 2013; Abdulghani & Hussain, 2025). The flipped method facilitates self-paced learning, where students can go through instructional materials over and over which enhances accuracy of skill acquisition as well as consistency in performance (Hew & Lo, 2018; Hassan & Abdulkareem, 2025).

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Despite growing international adoption of flipped learning, its application in athletics skill learning within physical education colleges remains limited, particularly in teaching long jump performance skills among university students.

However, the teaching methods of athletic skills in colleges of physical education are mainly through traditional conceptual instruction and classroom explanation to practical operation (including technical demonstration). In this mode, the students have limited time for application, which leads to difficulties in training. This paradigm may limit students' chances for repeated performance and faculty feedback tailored to individual circumstances—both necessary elements in the learning of motor skills like the long jump. Many students, as a result, have poor technical performance levels despite being regularly taught. Hence, the research problem is to determine whether implementation of the flipped learning strategy enhances long jump learning achievement compared to conventional teaching methods.

The present study aims to identify the effect of using the flipped learning strategy on improving the level of long jump learning performance among students of the College of Physical Education and Sport Sciences by comparing the learning outcomes of students taught using flipped learning with those taught through the traditional instructional method.

It is hypothesized that there are statistically significant differences between the pre- and post-tests in favor of the post-test for both groups, as well as statistically significant differences in the post-test results between the experimental and control groups in favor of the experimental group that used the flipped learning strategy in learning long jump performance.

This research has been significant because it proposes a current pedagogical method used in the teaching of athletics associated with technological learning and motor experience. This study promotes more efficient learning in physical education by increasing the time spent practicing, enhancing student engagement with their task, and enabling self-directed learning. It also provides scientific data about the effectiveness of flipped learning to the instructors and curriculum designers for developing skill performance in participating athletes, especially in the context of long jump learning among university students.

Methodology

Research Design

The current research was conducted using an experimental type of research design, adopting the equivalent groups of pre-test and post-test model to identify the impact of the implementation of the flipped learning strategy on students' level of long jump learning performance. This design was utilized so that the researcher could investigate the direct impact of the instructional strategy by comparing performance gains due to an educational intervention in a controlled environment.

For the purpose of this study, participants were divided into two equal groups. For the experimental group, teaching was done with a flipped learning strategy, using the reversed sequence of introduction and application of knowledge (the students are firstly exposed to educational resources before lessons in order to use classroom time primarily for exercising practical performances). On the other hand, the attendance control group was taught in a similar traditional teaching method as one of the frequently used methods for athletics lessons, which emphasizes explanation and demonstration during classroom time and practice.

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Both groups were delivered identical educational content directly related to long jump skills, and both groups were taught over the same instructional period. An identical testing protocol as well as comparable environmental conditions were used across groups during both the pre-test, administered prior to study implementation of the instructional program, and the post-test after completion of the intervention. By doing this, it made sure that any difference observed in terms of performance was due to the teaching strategy used alone and not to other external variables.

Participants

This study's research population included first-year students at the College of Physical Education and Sport Sciences in practical athletics classes during the academic year. From this population, a convenience sample of thirty students was selected that were appropriate to the study and are learning basic athletic skills such as the long jump.

After choosing the participants, they were randomly divided into two equal groups to prevent bias. So the first group was experimental group that consists of 15 students learning with flipped learning strategy, and second one was control one which also consist of 15 students only whom being taught by regular teaching method.

Before implementing the instructional program, each participant was checked by the researcher to ensure all were physically able to complete the required activities. Thus, students with injuries or any medical conditions that could affect physical performance were excluded. Moreover, none of the participants had ever received specialized training in long jump skills to ensure that students performed at a similar level before running the experiment.

In order to hold the experimental and control groups statistically equivalent prior to the administration of the instructional program, both groups were assessed for long jump skill performance under uniform testing conditions with a pre-test. To establish the existence of significant differences at the baseline level between the two groups, statistical analysis was conducted on pre-test results using independent sample t-test. The analysis reported no statistically significant differences $p > 0.05$ between groups at the pre-test measuring level of long jump skill performance which confirmed that experimental and control groups were equivalent on this measure prior to the start of the experimental intervention (see table1). This equivalence guaranteed that any differences detected in the post-test were related to the instructional strategy used rather than initial performance differences.

Table 1. Independent Sample t-Test for Pre-Test Differences Between Groups

Variable	Group	Mean	Std. Deviation	t-value	Sig. (p)
Long Jump Skill Performance	Experimental	9.47	1.12	0.21	0.835
	Control	9.39	1.08		

Instructional Program

The teaching intervention was conducted in the course of four successive weeks according to the dates of athletics practical lessons as organized by College of Physical Education and Sport Sciences. The educational program was meticulously structured to allow ample learning time during the experimental duration while gradually enhancing skill acquisition.

There were two instructional sessions per week on Sunday and Thursday, leading to a total of eight educational units delivered throughout the experiment. Each instructional

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unit was around 90 minutes long to allow ample time for skill explanation, on-ice practice, performance repetition, and feedback.

Both experimental and control groups were exposed to the same educational content related to technical phases in long jump performance (approach run, takeoff, flight, and landing). However, the difference between both the groups lay in the teaching methodology and technique used during instruction. In the experimental group, its flipped learning strategy was employed; on the contrary, in the control class, the conventional teaching method was used. This would allow variation in learning outcomes to be causally attributed, as appropriate, to the course being taught and not interactively or passively delivered content or duration of training sessions.

Implementation of the Flipped Learning Strategy

In this study, the flipped learning strategy was used intentionally based on the sequential stages of learning, which can enhance both students' cognitive understanding and practical performance skills in long jump. Before attending instructional sessions, the experimental group was provided educational materials (demonstration videos and model displays as well as physical/theoretical analysis of general stages (approach run, take-off, flight phase, and landing phases) of long jump skill performance. The content was provided via its digital channels, allowing the students to study and get a first overview before it would be applied in practice.

In class time, only practical performance related to instruction activities happened instead of any theoretical elaboration. The students would have practiced their skills repeatedly, involved in collaborative group learning opportunities and guided practice with the instructor. This method freed up lesson time for motor performance and also allowed the instructor to see individual performances closely enough to provide instant corrective feedback.

During the instructional program, students were given ongoing feedback and assessed on their performance to improve movement accuracy and technical execution. Moreover, the steady correction process argument helped in strengthening proper motor patterns and sustaining a better acquisition of long jump learning performance by collecting active engagement and continued practice.

Control group received education with common teaching method which is usually implemented in the field of athletics. In this method, the teacher used class time to provide verbal descriptions of the long-jump skill with a practical demonstration demonstrating how each technical phase of the skill should be performed. Students worked on the skill in a controlled fashion under the guidance of the instructor after watching a demonstration.

In the practice phase, participants practiced the long jump as instructed on presented slides while a trainer observed performance and gave instant corrective feedback. This conventional model of explanation and demonstration within the classroom, followed by performance practice represents the most frequently shared instructional approach in physical education lesson delivery.

Measurement Tools and Tests

A long jump learning performance was assessed to evaluate whether a technical skill performance evaluation helps measure the student’s learning level in the long jump event. The bones of the evaluation were about the four sequential main technical phases of skill: approach run, take-off, flight, and landing that reflect biomechanical basis unlike long jump's kinematics (Subiyanto, 2023; Wei et al., 2021).

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A standardized evaluation form based on athletic teaching protocols was developed, and performance assessments were recorded during testing sessions. A panel of qualified experts in the fields of sports and motor learning evaluated each contestant's performance to ensure an objective assessment.

Each phase of the long jump skill was assigned a score so that the sum of performance scores could show how well each student performed these skills. All subjects made 3 attempts and selected the best performance for evaluation and statistical analysis.

Table 2. Long Jump Skill Performance Evaluation Criteria

No.	Skill Phase	Technical Performance Indicators	Score
1	Approach Run	Gradual acceleration, rhythmic steps, maintaining body balance and correct running path	5
2	Take-off	Proper foot placement on take-off board, knee extension, arm swing coordination, vertical lift	5
3	Flight Phase	Body control in air, maintaining balance, correct leg positioning	5
4	Landing	Forward leg extension, trunk flexion forward, safe and balanced landing	5
Total Score			**20 Marks**

Validity and Reliability

The long jump skill performance evaluation form content validity. Selection criteria were adapted from scientific references in teaching of athletics and principles of motor learning literature directed on phases of long jump performance. Then, subsequent to its development, the evaluation form was administered to a panel of experts in athletics, motor learning and pedagogical approaches in physical education to assess appropriateness for use within diagnostic measures of learning performance in long jump.

Performance indicators relating to clarity, relevance and comprehensiveness were assigned to the technical-historical phases of long jump discussed (approach run, takeoff, flight and landing) as well. These were then refined according to their recommendations, making some minor changes to increase the accuracy and clarity of the assessment criteria. The assessment should cover the actual designed learning outcomes, which is validated by the consistency between experts in determining and evaluating it.

The test-retest method was used to evaluate the reliability of the evaluation form, thus making sure of the measurement consistency. The long jump skill was performed by a pilot sample drawn from students not included in the main research sample under similar testing conditions on two occasions, separated by a week.

The same scoring protocols and expert evaluators were used to score performances. The intraclass correlation coefficient was used to calculate the correlation between the scores for the first and second measurements, with Pearson’s relationship coefficient showing a high degree of consistency between scores ($r = 0.80$), which shows that this evaluation form has an acceptable level of reliability in measuring long jump learning performance.

Moreover, the inter-rater reliability was ensured by reaching an agreement on evaluators' scores and calculating for each participant male the mean of the evaluators' ratings as a final performance score to minimize subjective bias.

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Testing Procedures

Video recording was used to record students' performances during the testing sessions to provide accurate observation. Three experts in athletics and motor learning judged the recorded performances. Each expert alone evaluated the technical performance based on an evaluation form.

The final performance score of each student was calculated through the arithmetic mean of evaluators' scores so as to ensure objectivity and reduce biases in individual judgment.

All participants performed three trials, and one was selected per subject for evaluation and statistical analysis.

Experimental Procedures

The process adopted to conduct the initial experiment is as follows. First, pre-tests were conducted for both the experimental and control groups in a similar environmental and organizational context. All subjects were provided the same facilities, equipment, timing & evaluation procedures in order to ensure a fair experiment and establish baseline measurements of long jump skills performance prior to the implementation of the instructional intervention.

After pre testing, the instructional program was subsequently implemented over four consecutive weeks as originally planned. In this phase, the experimental group was instructed by using a flipped learning strategy while the control group was instructed through traditional teaching method. To control for learning conditions, both groups were presented with the same educational material and received an equal amount of instructional time.

Post-tests for both groups were then conducted following the same testing procedures, evaluation criteria and performance conditions used in pre-tests after the instructional program. Given that pre- and post-test scores were obtained under the same circumstances, this confirmed that differences observed between test results before versus after instruction were due in fact to strategy rather than changes in testing conditions.

Finally, all collected data were carefully recorded, organized, and prepared for statistical analysis in order to determine the significance of differences within and between the two groups.

Statistical Analysis

Analyses were performed in SPSS V. 26 to determine within and between study group differences. To describe the performance levels, mean and standard deviation were calculated for pre- and post-tests; whereas paired sample t-test was used to compare pre- and post-test findings within group. Also, independent sample t-test was used in order to compare post-test scores of experimental and control groups to identify impact of flipped learning strategy. Statistical significance was determined by $p \leq 0.05$.

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Results

Table 3. Comparison Between Pre- and Post-Test Results for the Experimental Group

Test	N	Mean	Std. Deviation	t-value	Sig. (p)
Pre-Test	15	9.47	1.12	9.86	0.000*
Post-Test	15	16.82	1.03		

* Significant at ($p \leq 0.05$)

Table 4. Comparison Between Pre- and Post-Test Results for the Control Group

Test	N	Mean	Std. Deviation	t-value	Sig. (p)
Pre-Test	15	9.39	1.08	4.12	0.001*
Post-Test	15	12.74	1.26		

* Significant at ($p \leq 0.05$)

Table 5. Independent Sample t-Test for Post-Test Differences Between Experimental and Control Groups

Variable	Group	Mean	Std. Deviation	t-value	Sig. (p)
Long Jump Skill Performance	Experimental	16.82	1.03	8.21	0.000*
	Control	12.74	1.26		

* Significant at ($p \leq 0.05$)

Discussion

The results of the current study showed that both teaching methods promoted long jump performance learning, but flipped learning instruction was more effective than traditional teaching method. The evolution within the experimental group is likely due to flipped learning, which readjusts the balance of in-class and out-of-class teaching time, shifting theoretical instruction away from a traditional didactic model towards more active motor practice with performance feedback.

From the motor learning perspective, practice randomization leads learners to do better during skill acquisition when they are given multiple opportunities to execute along with constant feedback and error correction. The flipped learning model meant that students came to practical sessions already cognizant of the phases of movement and so were able to engage at a deeper level in executing skills, moving more quickly from an understanding cognitively to stabilization of motor performance. New findings have demonstrated that as compared to traditional instructional models, flipped classrooms experience significantly improved motor skill acquisition and cognitive–motor integration in university students (Liu et al., 2025; Abdulkareem & Hassan, 2025).

In addition, one of the main reasons why the experimental group is superior to the control group may be attributed to learner autonomy and active learning abilities that were fostered by digital pre-class learning. This makes sense because when students have taken the time to go back and review their instructional videos many times before practice, they create better cognitive representations of the movement patterns that develop coordination during performance and technical accuracy. In physical education contexts, findings corroborating this trend also came to light: That technology-supported flipped learning

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increased the quality and accuracy of skill execution helped by improved learner engagement and opportunities for reflection (Lin et al., 2022; Abdulhussein et al., 2026).

While the control group did have some improvement, that won't be a surprise in motor learning situations where practice and instructor feedback exist. High-impact learning does occur in conventional fashion through demonstration and repetition, although these traditional methods of delivery afford less opportunity for active practice during an explanation of the material when done in class. Utilizing flipped learning strategies resulted in significantly higher levels of skill acquisition in experimental studies conducted in university physical education classes, which were already reported greater performance improvements when only receiving traditionally taught blocks as part of a lecture (Fathel, 2025; Jdaitawi, 2019).

Another significant rationale is motivational and psychological factors in flipped learning environments. Studies have shown that flipped instruction has positive effects on students' intrinsic motivation, self-efficacy, and learning satisfaction (Wu et al., 2025; Salman & Taha, 2024), which are strongly associated with persistence during practice of motor skills and better performance outcomes. Such increased motivation possibly led students in the experimental group to put more effort into giving multiple attempts and making corrections during long jump practice.

Nonetheless, the results lend support to contemporary pedagogical views promoting learner-centered and technology-integrated teaching in physical education. Flipped learning strategy seems to provide the ideal combination of cognitive, active, and feedback based factors that influence motor type skill acquisition.

Conclusions

The findings of the present study show that the flipped learning strategy has a positive and effective impact on improving long jump learning performance among students of the College of Physical Education and Sport Sciences. This approach helped to increase active practice time, promote cognitive warm-up through the division of skills into phases, and gather ongoing feedback in practical sessions, which led to increased technical execution amongst students. In addition to helping a skill specify improvement by repeated patterns of action via more conventional teaching models, a flipped learning model might be the optimal manner to instrument motor skills performance when compared to traditional approaches because it has been shown that it is more learner-focused and promotes insights from digital instructional resources that reinforce high active engagement and effective conditions for motor learning.

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Recommendations

Considering the study findings, it is suggested to include flipped learning strategies in athletics and physical education teaching programs for improving students' motor skill learning and practical performance. Faculty and instructors should utilize digital learning resources (e.g., instructional videos, interactive platforms) as pre-class preparation methods to help increase hands-on time in the classroom. Furthermore, as certain limitations were observed resulting from the included studies, they will be discussed in future research suggestions to evaluate the effectiveness of flipped learning for various sports skills, age categories, and educational levels, and also to assist performance development via retention of motor learning over time.

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Developing a strategic alignment scale for volleyball clubs in Iraq

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Abstract

This research goals to improve and apply a scale for strategic alignment and to explain the current state of strategic alignment among administrative board members of clubs participating in the Iraqi Volleyball Premier League Researchers employed a descriptive survey methodology. The research sample was selected purposively from 90 administrative board members of clubs in the second phase of the Premier League, representing 60% of the clubs participating These clubs included North Refineries, South Gas, Erbil, Central Refineries, Nineveh, Peshmerga Al-Daghara, Al-Muqdadiyah, Al-Ahwar, and Haditha. Discriminatory power, consistency and skewness coefficients were then calculated as part of the scale's improvement The researchers concluded that some clubs indicate significant interest in strategic alignment due to its vital role in fostering a relatively stable and problem-free environment as evidenced by their adoption of the dimensions of strategic alignment.

Keywords: Strategic alignment, administrative board members, volleybal

Introduction

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Modern sports management plays a vital and effective role in the success and prosperity of any organization The secret to an organization's success and progress relies on numerous surrounding variables as observed by Jihad and Taleb (2017, p. 157): "We observe that all sports organizations depend heavily on sports management built on scientific principles A country's progress in the sports field reflects the extent to which it ureses modern sports management in all its activities." Among the most prominent of these organizations are sports clubs characterized by high levels of competition. Their success or failure depends on the ability of their members to coordinate, integrate and understand each other in order to reacted quickly to changes and achieve desired goals It also depends on the ability of their members to reach and maintain a leading position among clubs and outperform their competitors particularly after the noticeable lower in volleyball clubs striving to establish their presence and achieve the excellence that distinguishes them. Hence the importance of this study lies in the importance of strategic alignment which plays a essential role in enabling clubs to coordinate and integrate their activities and work continuously review the organization in which they operate and coordinate with it by reconsidering its fundamental concepts. Its strengths and weaknesses, and what enables it to respond to environmental changes to explore and capitalize on opportunities as the speed of response to these changes facing clubs and the pursuit of excellence to maintain and develop its competitive position have become important.

Method and tools:

Methodology is "the sound scientific path that the researcher adopts to reach his desired goal that he set at the beginning of his research."

(Mohammed, K. (2024), pp. 782-797) The descriptive survey method was implemented because it connects with the research problem The research population was defined as all members of the administrative boards of sports clubs in the Iraqi Premier Volleyball League for the 2025-2026 sports season totaling (150) members distributed across (16) sports clubs. These clubs are: Peshmerga, Erbil, Al-Muqdadiyah, Al-Daghara, Al-Sina'a, North Refineries, South Gas, Al-Habaniyah, Haditha, Al-Kufa, Al-Nu'maniyah, Central Refineries, Nineveh, Al-Ahwar, Sulaf, and Hit. The research sample was chosen purposively from the second stage of the Premier League clubs, comprising (90) administrative board members of sports clubs in Iraq. These members are from the following clubs: North Refineries, South Gas, Erbil, Central Refineries, Nineveh, Peshmerga, Al-Daghara, Al-Muqdadiyah, and Al-Ahwar (modern) and at a rate of (60%) as shown in Table (1) as the reasons for the researchers' focus on this community and the adoption of field research procedures were as follows:

Table1.Presents the Research Population Based on the Members of the Administrative Boards of the Clubs Participating in the Premier Volleyball League During the 2025–2026 Sports Season

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No	Club name	Number of Members per Club	Pilot Sample	Construction Sample	Main Application Sample
1	Musafi Al-Shamal	10	--	10	10
2	Ghaz Al-Janoub	10	--	10	10
3	Erbil	10	--	10	10
4	Musafi Al-wasat	10	--	10	10
5	Haditha	10	--	10	7
6	Al-Miqdadiya	7	--	10	7
7	Al-Ahwar	10	--	10	8
8	Al-Daghara	8	10	--	10
9	Peshmerga	10	--	10	10
10	Nineveh	10	--	10	8
11	Hit	10	--	10	--
12	Al-Habbaniyah	10	--	10	--
13	Solaf	8	--	10	--
14	Al-Nu'maniyah	9	--	10	--
15	Al-Kufa	8	10	--	--
16	Al-Sina'a	10	--	10	--
	Total	150	20	130	90
	Percentage	%100	%13,33	86,66%	%60

Research samples:

Based on the requirements of the exploratory experiment and the application of the three measurement tools in this research the exploratory research sample include (20) members was chosen randomly and by lottery They represent the administrative body members of (Al-Daghara Club and Al-Kufa Club) Sports Club. Thus the percentage of the exploratory sample is (13.33%) of the research population. As for the sample for building the strategic alignment scale it is (130) members from the members of the Iraqi Premier League Volleyball Clubs, which number (16) clubs. Thus this sample demonstrate a percentage of (86.66%) of the total research population. As for the main experiment sample it included (90) members from the members of the Iraqi Premier League Volleyball Clubs by purposive method. They were chosen from the clubs of the second stage of the Premier League, which are (North Refineries, South Gas, Erbil, Central Refineries, Nineveh, Peshmerga, Al-Daghara Al-Muqdadiyah, Al-Ahwar, Haditha). Thus, this sample represents a percentage of (60%) of the total research population.

Defining the research variables:

Building a Strategic Alignment Scale: In order to arrive at a scale that meets the required scientific foundations from the first step of its construction until the completion of all requirements, the researchers carried out the scientific steps to build the scale after searching through the literature, sources, scientific references, and previous studies related to the strategic alignment scale, and seeking the opinions of some experts and specialists in

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order to reach the final version of the research procedures. Since the researchers did not find a previous study in the sports field that had addressed the topic of strategic alignment, the researchers decided to build a (strategic alignment) scale for the research sample, which is represented by the administrative body members in the Iraqi Premier League, as follows:

Defining the purpose of building the strategic alignment scale: The purpose of building the scale for members of the administrative body in the Premier League is to measure this variable.

Defining the theoretical framework for building the strategic alignment scale: By presenting the theoretical framework of the research, the theoretical premises upon which the researchers relied in building the alignment scale were identified, as they provide a clear theoretical vision from which the researchers proceeded to verify the procedures for building the scale. Accordingly, the theoretical premises were identified through the researchers' reliance on the relevant theoretical literature in defining the two concepts of alignment.

Defining the Axes of the Strategic Alignment Scale: To construct any sound and objective scale, a process of preparation and prior planning is required, ensuring researchers have a clear understanding of the axes.

This necessitates adopting the principle of analysis into its fundamental elements, where each element represents a specific domain or reference framework for the scale. After reviewing numerous sources and scales related to strategic alignment, the researchers identified and proposed (6) axes for the Strategic Alignment Scale that can be applied in the sports field. These axes are: (Communication Alignment, Infrastructure Alignment, Skills Alignment, Leadership Alignment, External Environment Alignment, and Organizational Alignment). An open-ended question was also included, and the researchers developed a theoretical definition of the Strategic Alignment Scale, as well as a theoretical definition for each of the scale's axes using a questionnaire.

The scale axes were then presented to (15) experts and specialists in the fields of management, organization, testing, and measurement to determine the validity of the scale's main axes, as shown in Table (2).

Table2. presents the calculated Chi-square (χ^2) values for determining the validity of the dimensions of the Strategic Alignment Scale.

No	Dimensions	Number of Agreeing Experts	Number of Disagreeing Experts	Calculated Chi-Square Value (χ^2)	Significance
1	Communication Alignment	13	2	8,07	Significant
2	Infrastructure Alignment	13	2	8,07	Significant
3	Skills Alignment	14	1	11,27	Significant
4	Leadership Alignment	15	0	15	Significant

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5	External Environment Alignment	15	0	15	Significant
6	Organizational Alignment	7	8	0,06	Not Significant

The tabulated value of (χ^2) is (3.84) at a significance level of (0.05) and under a degree of freedom of (1).

Table (2) shows that the calculated chi-square (χ^2) value for five axes (communication alignment, infrastructure alignment, skills alignment, leadership alignment, external environment alignment and organizational alignment) was higher than its critical value of 3.84 at a significance level of 0.05 and one degree of freedom. Therefore these axes were accepted However the organizational alignment axis was refaced because its calculated chi-square value was less than its critical value of 3.84 at a significance level of 0.05 and one degree of freedom Thus it was excluded.

To identify the relative importance of each axis of the strategic alignment scale the researchers improved a questionnaire and presented it to a group of 15 experts and specialists. The relative importance of the axes was determined using a scale of 1 to 10 with 10 being the most important axis and 1 the least important accordingly the researchers calculated the relative importance of the strategic alignment axes and their percentages For them as represented in Table (3).

Table3. presents the relative importance and percentages of the five dimensions of the Strategic Alignment Scale.

No	Dimensions	Dimension Score	Relative Importance of the Dimension	Percentage of Relative Importance(%)	Ranking of the Dimensions
1	Communication Alignment	**150**	**%100**	**%22,12**	First
2	Infrastructure Alignment	**140**	**%92,33**	**%20,64**	**Second**
3	Skills Alignment	**138**	**% 92**	**%20,35**	**Third**
4	Leadership Alignment	**130**	**%86,66**	**%19,17**	**Fourth**
5	External Environment Alignment	**120**	**%80**	**%17,69**	**Fifth**

Preparing the Strategic Alignment Scale Items: After determining the axes of the Strategic Alignment Scale the researchers began preparing the scale items based on numerous studies, research, the theoretical framework, and the definition that addressed the perspective of the strategic alignment axes. In light of this the researchers designed a questionnaire for the Strategic Alignment Scale containing items for the five axes of the scale These items were distributed throughout the axes according to the relative importance of each axis and each item represents the axis in which it was placed according to the

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theoretical definition of the axis. Thus the researchers proposed (50) items for the Strategic Alignment Scale distributed across (5) axes according to their relative importance to the scale as shown in Tables (4).

Table4. shows the dimensions of the Strategic Alignment Scale and the number of items for each dimension.

Scale	Total Number of Items	No	Dimensions	Total Number of Items
Strategic alignment	50	1	Communication Alignment	11
		2	Infrastructure Alignment	10
		3	Skills Alignment	10
		4	Leadership Alignment	10
		5	External Environment Alignment	9

Determining the validity of the strategic alignment scale statements: The questionnaire was presented to a group of experts and specialists numbering (15) experts and specialists in order to determine the validity of the statements their content their belonging to the axes in which these statements are included, and their belonging to the scale as a whole with mentioning their observations and suggestions regarding keeping, modifying, combining or adding statements to the scale in general. After collecting the forms the researchers used the good fit law (Chi2) to identify the validity of the scale statements and Table (5) shows the validity of the strategic alignment scale statements.

Table5. presents the calculated Chi-square (χ^2) values for determining the validity of each item of the Strategic Alignment Scale.

No	Dimension	Item Number	Number of Items	Validity		Calculated Chi-Square Value (χ^2)	Level of Significance
				Agreeing Experts	Disagreeing Experts		
1	Communication Alignment	1,2,3,4	4	12	3	5,4	Significant
		11,5,6,10,7	5	14	1	11,27	Significant
		8	1	6	9	0,06	**Not significant**
		9	1	6	9	0،06	**Not significant**
2	Infrastructure Alignment	3,4,5	3	15	0	15	Significant
		6,7	2	15	0	15	Significant
		8,1	2	14	1	11,27	Significant

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		2,9,10	3	5	10	1,67	**Not significant**
		7,3	2	13	2	8,07	Significant
		2,4,6	3	12	3	5,4	Significant
3	Skills Alignment	9,10	2	14	1	11,27	Significant
		1,5,8	3	5	10	1،67	**Not significant**
		3,6	2	4	11	3,27	**Not significant**
4	Leadership Alignment	9	1	4	11	3،27	**Not significant**
		2,7,8	3	15	0	15	Significant
		10,1,4,5	4	13	2	8,07	Significant
		1,2,6	3	15	0	15	Significant
		4	1	15	0	15	Significant
5	External Environment Alignment	7	1	14	1	11,27	Significant
		5,8,9,3	4	5	10	1,67	**Not significant**

The critical chi-square value (3.84) is at a significance level of (0.05) and under degrees of freedom (2-1=1).

Table (5) shows the calculated (Chi2) value to determine the validity of the strategic alignment scale statements. (15) statements were omitted because their calculated (Chi2) value was less than the tabulated (Chi2) value of (3.84) at a significance level of (0.05) and under a degree of freedom of (1) Thus the scale became composed of (35) statements allocated across axes.

Scale instructions: The scale instructions are as follows: -

A- Not writing the name on the form.

b) Answer all statements and do not leave any statement unanswered.

T- Read each statement carefully and thoroughly then select the appropriate answer.

The statements are answered based on to five alternatives: (always, often, sometimes, rarely, never). The method of answering is to select the appropriate alternative from among the five alternatives by placing a mark (√) in front of the appropriate alternative.

H- Do not place more than one mark (√) or choose more than one alternative.

Linguistic review of the strategic alignment scale statements: -After the scale statements were designed in their initial form they were presented to an Arabic language specialist to ensure the correct formulation of the statements and to evaluate them linguistically The observations and modifications made by the specialist were taken into account and thus the scale statements are free of linguistic issues.

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Determining the key to correcting statements: The researchers depended on the Likert method to correct the weights of the five alternatives which are: (always, often, sometimes, rarely, never), alternatives (always, often, sometimes, rarely, never) (1, 2, 3, 4, 5) respectively.

The pilot study of the strategic alignment scale:

After the initial version of the scale was improved the researchers carried out a pilot study of the (Strategic Alignment) scale This study was conducted with the assistance of the support team on a sample of (20) members showing the members of the Al-Daghara and Al-Kufa Club and within the research population on 11/15/2025 at the headquarters of the Al-Kufa and Al-Daghara Club. The purpose of conducting the pilot study was to determine the following:

1- Clarity of the scale's statements and instructions.
2- The time taken to answer the scale statements.
3- The capacity of the support team to assist researchers in the procedures for implementing the scale.
4- Avoiding and overcoming some challenges during the implementation of the scale.

It was verified that the scale with its instructions and statements was appropriate for the research sample, and thus the scale became ready for application.

Applying the scale to a construction sample:

The researchers employed the scale to a sample of (130) members of the building team whose clubs participate in the Iraqi Premier Volleyball League namely (Peshmerga, Erbil, Al-Muqdadiyah, Al-Sina'a, North Refineries, South Gas, Al-Habaniyah, Haditha, Al-Nu'maniyah, Central Refineries, Nineveh, Al-Ahwar, Sulaf, Heet) for the period from 11/20/2025 to 12/30/2025. After completing the final allocation of the forms and answering them the researchers tabulated the data of the building team members after collecting and arranging it in preparation for its statistical analysis and the scale was utilized with the help of the assisting work team.

Statistical analysis of the strategic alignment scale:

The researchers followed two methods in analyzing the items of the scale (strategic alignment), namely (discriminatory ability - internal consistency).

First: -The two extreme groups (discriminatory ability):

In order to acquire the discriminatory power of the scale items the answers of the construction sample for statistical analysis containing (130) members out of a total of (150) were tabulated into a table Then the method of two equal-numbered extreme groups was used, with (27%) in each group as the percentage (27%) is regarded as one of the preferred percentages to identify the strength of the item in distinguishing between the upper and lower groups Then the results of the scores of the two groups were processed using the (t-test) law for uncorrelated samples for each item of the scale as follows:

The discriminatory power of the strategic alignment scale:

A t-test was performed between the arithmetic means of the two extreme groups and the findings of shown in Table (7) were acquired.

Table7. presents the calculated (t) values for determining the discrimination coefficient of each item in the Strategic Alignment Scale applied to the construction sample.

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Item Number	Group	Mean	Standard deviation	Calculated t-value	Significance sig	Significance
1	Upper Group Lower Group	4,077 3,181	0,877 0,847	3,897	0,000	Significant
2	Upper Group Lower Group	3,431 3,407	0,843 0,843	0,313	755,0	Not significant
3	Upper Group Lower Group	4,000 3,222	0,832 0,751	3,606	0,001	Significant
4	Upper Group Lower Group	4,037 3,578	0,758 0,965	2,180	0,034	Significant
5	Upper Group Lower Group	4,296 3,188	0,724 0,729	5,645	0,000	Significant
6	Upper Group Lower Group	3,929 3,222	0,926 0,697	1,826	0,074	Not significant
7	Upper Group Lower Group	4,185 3,151	0,833 0,891	4,572	000,0	Significant
8	Upper Group Lower Group	4,000 3,252	0,832 0,847	3,403	0,001	Significant
9	Upper Group Lower Group	4,000 2,925	0,784 0,868	4,891	0,000	Significant
10	Upper Group Lower Group	4,185 2,629	0,833 0,669	7,738	0,000	Significant
11	Upper Group Lower Group	4,148 2,814	0,863 0,735	6,403	0,000	Significant
12	Upper Group Lower Group	4,454 2,592	0,577 0,572	4,546	0,000	Significant
13	Upper Group Lower Group	4,158 2,851	0,863 0,818	5,661	0,000	م Significant
14	Upper Group Lower Group	4,181 2,888	0,800 0,840	5,609	0,000	Significant
15	Upper Group Lower Group	4,434 2,592	0,577 0,572	7,854	0,000	Significant
16	Upper Group Lower Group	4,148 2,666	0,769 0,733	7,238	0,000	Significant
17	Upper Group Lower Group	3,888 3,333	0,974 0,877	2,202	0.032	Significant
18	Upper Group Lower Group	3,747 3,111	0,913 1,012	2,515	0.015	Significant
19	Upper Group Lower Group	3,878 3,666	0,847 0,919	0,923	0,360	Not significant
20	Upper Group Lower Group	4,111 2,963	0,800 0,897	4,959	000,0	Significant
21	Upper Group Lower Group	4,138 2,814	0,863 0,735	4,304	0,000	Significant
22	Upper Group	4,407	0,636	7,369	0,000	Significant

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	Lower Group	2,925	0,828			
23	Upper Group	4,148	0,769	7,238	0,000	Significant
	Lower Group	2,656	0,733			
24	Upper Group	4,185	0,833	7,738	0,001	Significant
	Lower Group	2,629	0,629			
25	Upper Group	4,444	0,577	9,743	0,000	Significant
	Lower Group	2,542	0,572			
26	Upper Group	3,777	0,933	2,623	0,011	Significant
	Lower Group	3,074	1,035			
27	Upper Group	3,730	0,944	3,263	0,002	Significant
	Lower Group	2,000	0,974			
28	Upper Group	4,138	0,863	3,110	0,000	Significant
	Lower Group	2,814	0,735			
29	Upper Group	3,723	0,992	2,534	0,014	Significant
	Lower Group	3,037	0,939			
30	Upper Group	4,409	0,636	7,369	0,000	Significant
	Lower Group	2,925	0,828			
31	Upper Group	4,148	0,769	7,238	0,000	Significant
	Lower Group	2,000	0,733			
32	Upper Group	4,000	0,784	4,891	0,000	Significant
	Lower Group	2,925	0,828			
33	Upper Group	4,185	0,833	7,738	0,000	Significant
	Lower Group	2,659	0,629			
34	Upper Group	4,148	0,863	3,303	0,000	Significant
	Lower Group	2,814	0,735			
35	Upper Group	4,434	0,577	8,432	000,0	Significant
	Lower Group	2,592	0,572			

Significance level (0.05), degrees of freedom (n-2) = 68. The t-value is significant if the value of the degree of (significance error) ≤ (0.05).

Table (7) shows the calculated (t) values and significance levels (sig) Most of the statements (≤) were at a significance level of (0.05) at a degree of freedom of (68) except for statements (19, 6, 2), which had an issue significance level greater than (0.05) This reveals that all statements on the scale are distinctive except for (3) statements (19, 6, 2) which are considered non-distinctive Thus the number of acceptable statements becomes (32).

Second: Internal Consistency:

The internal consistency coefficient of the scale was calculated to identify the correlation of statements with the total scale score as well as the correlation of statements with the score of the axis to which they be part of and the correlation of the axis with the total scale score To find this coefficient Pearson's simple correlation coefficient was used as follows:

Internal consistency of statements (the correlation of a statement with the score of the axis to which it belongs):

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The correlation coefficient between the score of a statement and the score of the axis for all statements is significant cause the issue values for the correlation values are less than the significance level (0.05) As shown in Tables (8).

Table8. shows the correlation coefficient (r) between the score of each item and the score of the dimension to which it belongs in the Strategic Alignment Scale.

Dimension	Item Number	Correlation Coefficient Values	Standard error	Significance
Communication Alignment	1	0.591	0.000	Significant
	2	0.547	0.000	Significant
	3	0.582	0.000	Significant
	4	0.708	0.000	Significant
	5	0.434	0.000	Significant
	6	0.536	0.000	Significant
	7	0.603	0.000	Significant
	8	0.801	0.000	Significant
	9	0.640	0.000	Significant
Infrastructure Alignment	10	0.787	0.000	Significant
	11	0.752	0.000	Significant
	12	0.650	0.000	Significant
	13	0.787	0.000	Significant
	14	0.642	0.000	Significant
	15	0.366	0.000	Significant
	16	0.283	0.004	Significant
Skills Alignment	17	0.675	0.000	Significant
	18	0.655	0.000	Significant
	19	0.629	0.000	Significant
	20	0.713	0.000	Significant
	21	0.658	0.000	Significant
	22	0.671	0.000	Significant
	23	0.447	0.000	Significant
Leadership Alignment	24	0.505	0.000	Significant
	25	0.576	0.000	Significant
	26	0.415	0.000	Significant
	27	0.694	0.000	Significant
	28	0.710	0.000	Significant
External Environment Alignment	29	0.646	0.000	Significant
	30	0.715	0.000	Significant
	31	0.660	0.000	Significant
	32	0.836	0.000	Significant

Significance level (0.05) Degrees of freedom (n-2) = 128 Value of (r) is significant if the value of the degree (significance of error) ≤ (0.05)

Internal consistency of statements (the relationship of the statement to the total score of the scale):

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Based on the responses of the sample members (the constructor sample) which numbered (130) members, and this is achieved through the use of the simple correlation coefficient as shown in Tables (9).

Table9. shows the values of the calculated correlation coefficients (t) between the score of each item and the total score of the Strategic Alignment Scale.

Item Number	**Significance of Correlation**	**Error Level Sig**	**Significance of Correlation**	Item Number	**Significance of Correlation**	**Error Level Sig Sig)(**	**Significance of Correlation**
1	**0.466**	**0,000**	**Significant**	**17**	**0.558**	**0,000**	**Significant**
2	**0.290**	**0,003**	**Significant**	**18**	**0.680**	**0,000**	**Significant**
3	**0.241**	**0,016**	**Significant**	**19**	**0.634**	**0,000**	**Significant**
4	**0.501**	**0,000**	**Significant**	**20**	**0.689**	**0,000**	**Significant**
5	**0.530**	**0,000**	**Significant**	**21**	**0.702**	**0,000**	**Significant**
6	**0.352**	**0,000**	**Significant**	**22**	**0.815**	**0,000**	**Significant**
7	**0.559**	**0,000**	**Significant**	**23**	**0.155**	**0,124**	**Not Significant**
8	**0.702**	**0,000**	**Significant**	**24**	**.0247**	**0,013**	**Significant**
9	**0.680**	**0,000**	**Significant**	**25**	**0.680**	**0,000**	**Significant**
10	**0.815**	**0,000**	**Significant**	**26**	**0.298**	**0,003**	**Significant**
11	**0.585**	**0,000**	**Significant**	**27**	**0.634**	**0,000**	**Significant**
12	**0.509**	**0,000**	**Significant**	**28**	**0.689**	**0,000**	**Significant**
13	**0.815**	**0,000**	**Significant**	**29**	**0.559**	**0,000**	**Significant**
14	**0.689**	**0,000**	**Significant**	**30**	**0.702**	**0,000**	**Significant**
15	**0.272**	**0,010**	**Significant**	**31**	**0.680**	**0,000**	**Significant**
16	**0.128**	**0,205**	**Not Significant**	**32**	**0.815**	**0,000**	**Significant**

Significance level (0.05) Degrees of freedom (n-2) = 98 The value of (r) is significant if the value of the degree (significance of error) ≤ (0.05)

Table (9) shows that the correlation coefficients between the scores of the scale items and the total scale score were less than the significance level of (0.05) demonstrating that they met the scientific conditions for accepting correlations in internal consistency with the exception of items (16) and (23) Item (16) from the third domain (Skills) and item (23) from the fourth domain (Leadership) had values greater than the significance level of (0.05) and therefore they were excluded. Thus the scale now contains (30) items.

Internal consistency of the axes (the relationship between the axis and the total scale score) This means that the axis measures the same perspective as the total scale score based on the responses of the sample members (the construct sample) which numbered (130) members The correlation coefficient between the axis score and the total scale score for all axes was significant because the error level values for the correlation values were less than the significance level of (0.05) as shown in Table (10).

Table10. shows the results of the correlation coefficient between the scores of the dimensions of the Strategic Alignment Scale and the overall score of the scale.

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No	Dimension	Number of Items	Correlation Coefficient	Error Level sig)(	Significance of Correlation
1	Communication Alignment	**7**	**0,706**	**0,000**	**Significant**
2	Infrastructure Alignment	**7**	**0,945**	**0,000**	**Significant**
3	**Leadership Alignment**	**6**	**0,915**	**0,000**	**Significant**
4	**Leadership Alignment**	**5**	**0,921**	**0,000**	**Significant**
5	**External Environment Alignment**	**5**	**0,968**	**0,000**	**Significant**

Significance level (0.05) Degrees of freedom (n-2) = 128 Value of (r) is significant if the value of the degree (significance of error) ≤ (0.05)

The Scientific Foundations of the Strategic Alignment Scale:

A. Scale Validity: - Validity is one of the crucial scientific foundations of any test or scale It refers to "the validity or correctness of the test, i.e whether it actually measures the function for which it is planned without measuring any other function alongside it" (Mustafa et al., 2006, p. 111) as follows: -

First: - Content Validity: - The researchers sought to reach this type of validity by presenting the scale items and their respective answer choices to a group of experts and specialists mentioned previously to determine their validity The results in Table (5) show that the experts agreed on the scale items.

Second: -Construct Validity: -This type of validity for the scale was verified through statistical analysis using the two-groups method (discriminatory ability), as shown in the results of Table (7), in addition to extracting the values of the internal consistency coefficient as shown in the results of Tables (8, 9, 10).

B- Scale Reliability: -

There are mutable methods by which the reliability coefficient can be extracted and the researchers select two methods:

First: The split-half method:

To extract reliability the researchers used the data acquired from the construct sample which consisted of (130) members. The (strategic alignment) statements were (30) consecutively Then the statements were separated into two sections: statements with even numbers and statements with unusual numbers The researchers used the simple correlation coefficient to determine the correlation relationship The value of the correlation coefficient for the strategic coordimation scale was (0.902) However this value represents the reliability coefficient of the half of the test so the value of the reliability coefficient for the test as a

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whole must be corrected Therefore the reliability coefficient value for half of the strategic alignment scale was modified using the Spearman-Brown equation and it was found that the scale has high reliability as shown in Table (11):

Table11. shows the reliability coefficient of the Strategic Alignment Scale using the split-half method.

No	Scale	Pearson Correlation Coefficient	Spearman–Brown Formula	significance
1	Strategic alignment	0.902	0.860	Significant

Second: Cronbach's Alpha Equation:

Reliability was determined by applying Cronbach's alpha equation to the (130) members of the construction sample using the SPSS statistical package The results presented a high reliability coefficient for the scale as shown in Table (12).

Table. shows the Reliability of the Scale Using Cronbach's Alpha Coefficient

No	Scale	Cronbach's Alpha	significance
1	Strategic alignment	0.930	Significant

Final Description of the Strategic Alignment Scale:

After completing all the procedures for constructing the strategic consistency scale the scale was finalized It consisted of (30) statements distributed across five axes and (30) statements (see Appendix 1). The highest possible score was (150) while the lowest possible score was (30). Therefore the hypothetical mean of the scale was (90).

Applying the Scale to the Main Sample:

After completing all the requirements for improving the strategic alignment scale and ensuring its readiness the researchers, with the support team implemented the scale to a sample of (90) members of the administrative boards of the clubs participating in the second phase of the Iraqi Premier Volleyball League. These clubs were: North Refineries, South Gas, Erbil, Central Refineries, Nineveh, Peshmerga, Al-Daghara, Al-Muqdadiya, Al-Ahwar and Haditha. The application date was from January 3, 2026, to February 3, 2026 (90) valid scale forms were received. After analyzing the responses of the research sample the data were collected on a special form assigning each member of the sample a score on the scale The findings were then compiled by the researchers.

Statistical Methods Used in the Research: The researchers used the SPSS statistical package to extract the results of the current research consisting the following:

Results

The researchers demonstrate the results of the strategic alignment scale for volleyball sports clubs in Iraq. They present the statistical description of the results of the

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strategic alignment scale the values of the arithmetic mean standard deviation and skewness coefficient in order to assess the distribution of the application sample.

Table13. shows the normal distribution of the research sample on the Strategic Alignment Scale is presented.

Scale	Mean	Standard deviation	Skewness Coefficient
Strategic alignment	126‹61	8‹68	0‹91

Table 14. shows the arithmetic means, standard deviations, calculated one-sample t-test values and hypothetical means of the Strategic Alignment Scale.

No	Strategic Alignment Scale	Number of Items	Mean	Standard deviation	Hypothetical Mean	One-Sample t-Test Value	Level of Error	Statistical Significance
1	Strategic alignment	30	126‹61	8‹68	90	40‹00	0,001	**Significant**
Significant at(0,05) ≥								

Discussion

Discussion of the findings of strategic alignment among volleyball sports clubs in Iraq.

The research sample for the strategic alignment scale showed that the research sample achieved arithmetic means higher than the hypothetical means and the issue level for the calculated t-value was less than the significance level of 0.05

The researchers characteristic this to the fact that the levels of strategic alignment in its different dimensions (communication alignment, infrastructure alignment, skills alignment, leadership alignment and external environment alignment) were high This demonstrates that the members of the organization possess a good degree of awareness and administrative experience that enables them to achieve a high degree of compatibility and integration among the components of administrative work This is verified by Abdul Karim (2016, pp. 45–67), who stated that "strategic alignment contributes significantly to lowering the efficiency of organizational performance by achieving harmony between human resources, infrastructure, leadership, and communication within the organization." The study also showed that the administrative leaders' possession of experience and knowledge enhances their ability to reach this alignment effectively. These results are consistent with what Abdul Ghani's study in the sports field established: that effective and sound communication is one of the most vital factors that plays essential role in achieving team cohesion, and through it organization can be achieved. Activity, regardless of its type, consequently impacts the results of sports teams which matches with the high scores in

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communication and leadership alignment in the current study. (Abdul Ghani, S., & Youssef, A. 2019, p. 110).

Thus it becomes clear that the results of the present study are consistent with what has been confirmed in Arabic literature The high levels of strategic alignment among the sample members indicate their possession of integrated administrative abilities that contribute to achieving harmony among the various elements of the organization This positively impacts administrative and athletic performance.

This is confirmed by Aziz's study: "Members of the administrative bodies of sports clubs often seek to adopt evaluation standards that improve the effectiveness of their work as a basis for success.

Their work is not without challenges, difficulties and advantages, which necessitates reviewing and monitoring it to improve their performance at the need level.

The focus on administrative ideas to search for ways to find practical solutions in improving administrative and technical work in the sports field creates a acceptable environment for providing alternatives to address the weakness of measurement continuously" (Aziz, N., & Hamad, T. (2019), p. 244). "Likewise members of the club's administrative body possess the ability to organize the flow of information clearly and consistently with the club's general objectives which decrease instances of contradiction and misunderstanding The positive research results indicate the availability of supportive capabilities and systems that This aligns with the requirements of administrative and sporting work enhancing the efficiency of institutional performance.

The findings also demonstrate that members of administrative bodies possess skills and experience relevant to their assigned tasks, contributing to the efficient achievement of objectives. Furthermore, the positive results reflect the presence of capable administrative leaders who can guide work and unify efforts within a clear strategic vision. Additionally, the clubs demonstrate their ability to adapt to external changes and interact with their surrounding environment in a way that serves their goals whether these changes are social, economic or sporting.

Therefore, it can be said that the high strategic alignment scores according to the integrated expertise of administrative body members in these areas which has positively affected their responses This may also be attributed to the accumulation of administrative experience and continuous engagement with sporting work which has contributed to strengthening their capacity to achieve harmony and synergy in all assigned tasks.

Conclusions

1- It has become clear that some clubs are showing great interest in strategic alignment due to its significant importance in creating a relatively stable and problem-free environment as they use the dimensions specific to strategic alignment.

2- Researchers found that some clubs are keen to carry out periodic evaluations of their irrigation staff and document them with the aim of achieving superiority over other clubs.

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3- The modern work environment requires effective leaders who are able to support and assist others.

Recommendations

1- Clubs must be continuously keen to follow modern management methods and strategies.

2- The researchers suggest the need to pay attention to the club's infrastructure using the latest methods and means for the purpose of creating excitement and ease for the members of the body in order to bring out the best of their skills to serve the club.

3- Researchers recommend improving the club's administrative skills by involving them in courses that encourage teamwork which adds more enjoyment to the work than individual work.

4- Clubs that want to generate a harmonious working environment should provide means for interaction among their members.

5- Creating a work environment that connect with the specializations of the employees to increase their enthusiasm and performance satisfaction and to develop their sense of belonging to their clubs.

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The Contribution of Some Physical Abilities to the Accuracy of the Forehand Groundstroke Skill in Squash Among Iraqi Premier League

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Abstract

The importance of the research lies in studying the skill of the front ground strike in squash in order to reach the values of the studied physical abilities and the extent to which these abilities contribute to the accuracy of the front ground strike skill to reach the best accuracy in the chosen skill and thus lead to better performance and then achieve the goal of skill performance, which is to achieve a point in the game, but the problem of the research lies in answering the following questions: Knowing what physical abilities have a great role in the accuracy of the forehand grounding skill in the game of squash and knowing its values .Knowing the contribution percentage of each ability researched in the accuracy of the front ground strike skill in the game of squash .Therefore, the two researchers decided to go into the study of the problem by knowing the percentage of the contribution of some physical abilities accurately the skill of the front ground strike in squash on the players of the Iraqi Premier League in squash, and the objectives of the research Identify the most important physical abilities that have a significant role in the accuracy of the front ground strike skill in the game of squash among the Iraqi Premier League players in squash .Knowing the percentage of the contribution of each of the physical abilities to the accuracy of the front ground strike skill in the game of squash among the Iraqi Premier League players in squash .As for the research methodology, the researcher used the descriptive approach in the method of correlational relations in order to suit the nature of the research problem. As for the research community and sample, the community researcher was chosen in the deliberate way represented by the players of the Iraqi Premier League in squash. The research sample was chosen in a random way, as players were selected from each club and the total research sample was (24) players. As for the statistical means, the two researchers used the SPSS program to analyze and process the data statistically. The most important conclusions reached by the two researchers are : In order to improve accuracy, it is necessary to develop the physical qualities, especially the strength and flexibility of the Iraqi Premier League players in squash.

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As for the most important recommendations reached by the two researchers: Using tools and training means in order to develop physical qualities and thus develop the accuracy of the Iraqi Super League squash players.

Keywords: Contribution, Accuracy, Forehand Groundstroke Skill, Squash.

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Introduction:

Squash is an individual sport that requires its players to possess specific characteristics that enable them to perform the basic skills of the game, particularly the forehand groundstroke, with a high level of proficiency.

A squash player should possess a high level of physical abilities that qualify them to perform the forehand groundstroke and other fundamental skills in squash effectively and accurately. Among the most important of these physical abilities are strength, flexibility, and speed, which play a major role in the accuracy of the forehand groundstroke in squash. Based on the above, the importance of this study lies in examining the forehand groundstroke skill in squash in order to identify the values of the investigated physical abilities and determine the extent of their contribution to the accuracy of the forehand groundstroke.

This is intended to achieve the highest possible level of accuracy in the selected skill, thereby leading to better performance and ultimately
accomplishing the objective of skill execution, which is scoring a point during play.

Research Problem:

The forehand groundstroke is considered one of the fundamental skills in squash and plays a significant role in scoring points. Through attending training sessions of Iraqi Premier League squash players and observing their matches, the researchers noticed a slight weakness in the accuracy of the forehand groundstroke among these players. The researchers attributed this weakness to deficiencies in certain physical abilities, particularly strength and flexibility, which negatively affect the accuracy of skill performance. Therefore, the research problem seeks to answer the following questions:

- What are the physical abilities that play a major role in the accuracy of the forehand groundstroke in squash, and what are their values?
- What is the percentage contribution of each investigated physical ability to the accuracy of the forehand groundstroke in squash?

Accordingly, the researchers decided to investigate this problem by identifying the contribution of some physical abilities to the accuracy of the forehand groundstroke among Iraqi Premier League squash players.

Research Objectives

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- To identify the most important physical abilities that play a major role in the accuracy of the forehand groundstroke in squash among Iraqi Premier League squash players.
- To determine the percentage contribution of each physical ability to the accuracy of the forehand groundstroke among Iraqi Premier League squash players.

Methodology and Instruments

Research Method

The researchers used the descriptive method with a correlational approach, as it was appropriate for the nature of the research problem. This is consistent with (Diaa Subhi Kazem and Yasser Najah Hussein, 2022), who stated that correlational research aims to study the relationship among variables of different types, whether they are continuous or discrete, regardless of the number of variables.

Research Sample

One of the most important scientific considerations that researchers should take into account is selecting a sample that truly and accurately represents the research population. Therefore, the research population was selected intentionally and consisted of the Iraqi Premier League squash clubs, which included (12) clubs. The research sample was selected randomly by choosing two players from each club, making a total of (24) players.

Data Collection Methods

- Arabic and foreign references.
- Personal interviews.
- Observation.
- The Internet.
- Data recording forms.
- Computer software and applications.
- Tests and measurements.

Equipment and Instruments Used in the Research:

- Two (2) DELL laptop computers, manufactured in China.
- A metric measuring tape.

Tests Used in the Research:

First Test: Throwing a 2-kg medicine ball.
(Naseef Jasim Mohammed and Firas Mohammed Kareem, 2018)
Second Test: Sit-and-Reach Test (Arm Extension). (Sura Mahmood, 2016)

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Third Test: Forehand Groundstroke Accuracy Test Toward a Divided Target. (Manahel, 2012, p. 67)

Purpose of the Test:

To measure the accuracy of the forehand groundstroke.

Test Procedures:

The test is conducted on a standard squash court using squash rackets, squash balls, and a score recording form. Five square targets are drawn on the right side of the front wall. Each square measures 35 cm × 35 cm, with a distance of 25 cm between each two adjacent squares. Figure ( ) illustrates the scoring targets, the players' standing position, and the procedures for conducting the test.

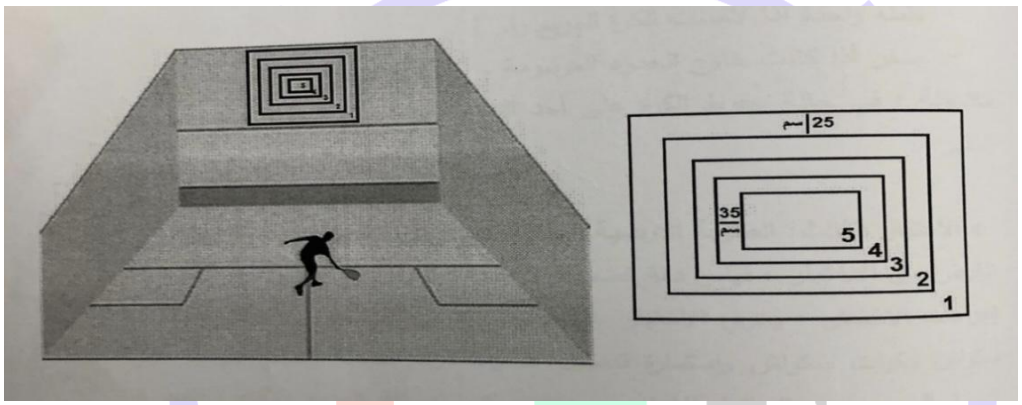


Figure (1) illustrates the forehand groundstroke test toward the divided target.

Performance Description:

The test requires the player to stand behind the service box facing the right side wall while assuming the correct forehand groundstroke position. After the test has been explained, each player is given five (5) practice attempts following the warm-up to become familiar with the test procedure. Each player is then allowed ten (10) official attempts, during which they continuously hit the ball toward the divided target. The player must strike the ball after it has bounced on the floor; otherwise, the attempt is considered invalid.

Scoring:

Points are awarded for each successful attempt as follows:

- Five (5) points if the ball hits Square No. 5.
- Four (4) points if the ball hits Square No. 4.

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- Three (3) points if the ball hits Square No. 3
- Two (2) points if the ball hits Square No. 2.
- One (1) point if the ball hits Square No. 1.
- Zero (0) points if the ball lands outside the marked areas.

Note. If the ball lands on the line shared by two squares, the score of the higher-value square is awarded.

Pilot Study:

The researchers conducted a pilot study on six (6) players who were not included in the main research sample. The study was carried out on Thursday, January 15, 2026, at 3:00 p.m. in the squash courts of the College of Physical Education and Sport Sciences, University of Baghdad. The pilot study aimed to verify the suitability of the equipment and instruments used in the research, ensure that the selected tests were appropriate for the research sample, evaluate the efficiency of the assisting team, and determine the time required for each test and for each player.

Main Study:

The researchers conducted the main study on the research sample, which consisted of players from the Iraqi Premier League Squash clubs. The research population included twelve (12) clubs, and the research sample consisted of twenty-four (24) players. All tests were carried out on a single day, Thursday, January 22, 2026, at 3:00 p.m. Two squash courts at the College of Physical Education and Sport Sciences were used, with each court prepared for one specific test.

Statistical Methods:

The researchers used the Statistical Package for the Social Sciences (SPSS) to analyze the data statistically. The following statistical measures were calculated: arithmetic mean, standard deviation, correlation coefficient, and contribution percentage.

Results:

Table 1. The shows Means and Standard Deviations of Strength and Flexibility in Relation to the Accuracy of the Forehand Groundstroke Skill

Tests	mean	SD
A wide leap from a stationary position, with the front kick accurately directed towards the split target	1.32	0.15
Sit-and-reach test (arms outstretched), with the front kick accurately directed towards the split target	14.20	4.008

Table2. The shows Correlation Coefficient, Contribution Percentage,

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Significance Value, and Significance Level of Strength and Flexibility in Relation to the Accuracy of the Forehand Groundstroke Skill

Tests	Correlation coefficient	Contribution Percentage	SIG	Significance
A wide leap from a stationary position, with the front kick accurately directed towards the split target	0.890	0.792	0.03	Significant
Sit-and-reach test (arms outstretched), with the front kick accurately directed towards the split target	0.981	0.978	0.02	Significant

Note. All p-values **≤ 0.05 are statistically significant at 19 degrees of freedom (df = 19).**

Discussion of the Results:

According to Table (2), the Medicine Ball Throw test, which measures the explosive strength of the arms, showed an effect on the accuracy of the forehand groundstroke. Strength plays a fundamental role in accuracy. As is well known, increasing force may reduce accuracy. Squash is a fast-paced sport that requires a high level of strength to enable players to score points and win matches. This is consistent with Firas Matchar and Farah Essam (2018), who stated that strength is one of the most important physical abilities that athletes seek to develop, especially in squash, because the fast and physically demanding nature of the game requires considerable strength to maintain the same level of performance throughout the match. They also pointed out that developing strength improves movement patterns.

Furthermore, Ali Kamal Hussein et al. (2020) stated that strength ranks first among the physical abilities required in most sports activities. In addition, Mohammed Abdul Hassan (2010, p. 27) explained that strength is one of the fundamental physical abilities that plays an important role in sports performance, particularly in squash. The integration of strength with flexibility and movement speed provides the player with a high level of movement efficiency.

Regarding flexibility, Table (2) shows that its contribution percentage was very good. Flexibility is also considered one of the essential
physical abilities that squash players should possess because of the small court dimensions, the speed of play, and the rapid rebound of the ball. Therefore, players should have a high level of flexibility, in addition to the ability to return the ball quickly, especially when performing the forehand groundstroke. Mohammed Ibrahim Shehata (2006, p. 63) stated that flexibility allows the optimal application of force through the appropriate range of movement according to the technical requirements of performance, particularly in squash.

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The researchers believe that strength and flexibility are among the most important physical abilities that squash players should develop continuously. These abilities enable players to score points, maintain continuous rallies, and perform consistently throughout the match. This agrees with Farah Essam Abdul Amir and Ali Shaboot Ibrahim (2023), who stated that flexibility is one of the most important physical abilities athletes should acquire because it increases movement capacity, which positively affects the accuracy of the forehand groundstroke in squash.

Conclusions:

- Strength plays a major role in the accuracy of the forehand groundstroke in squash.
- Flexibility and reaching the ball at an early stage help players achieve greater accuracy in the forehand groundstroke.
- It is necessary to design training programs to develop physical abilities, particularly strength and flexibility.
- Similar studies should be conducted on other physical abilities.
- Training equipment and instructional aids should be used to develop physical abilities, especially strength and flexibility, thereby improving the accuracy of Iraqi Premier League squash players.

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The Impact of the Gerlach and Ely Model on Learning Forehand and Backhand Strokes in Tennis for Female Students

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Abstract

The current study aimed to improve educational units based on the Girac-Ely model for teaching female students the forehand and backhand stroke skills in tennis The researcher used an experimental design with a control group and an experimental group employing pre- and post-tests. The research population include sample of 71 female students from Al-Fahoud High School for Gifted Students during the 2025-2026 academic year. The research sample consisted of 30 students divided into experimental and control groups of 15 students each. Four students were selected for a pilot study. A curriculum was developed incorporating the Girac-Ely model, consisting of 14 educational units. The forehand and backhand stroke test was used to measure the sample's progress. Data were statistically analyzed using SPSS. The researcher concluded that the Girac-Ely model had a positive impact on learning the selected skills and recommended its adoption for tennis players' learning and development as well as its integration into sports activities. Other.

Keywords: Gerlach and Ailey model, teaching units, forehand and backhand stroke skills, tennis.

Introduction:

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Life in general has witnessed remarkable and important development in its different fields thanks to the efforts of scientists and specialists who followed the right scientific methods and formulas for this objective.

Among these fields is sports and physical education.

The structure of the educational process is based on three main variables: the teacher, the learner and the learning objective Each of these variables has a specific environment that connect with each other and shapes the outcome of the educational process. Therefore the focus has shifted to maximizing the use of learning environments which is vital for achieving effective learning.

The teacher's learning environment includes teaching skills, teaching style and method, assessment, teaching performance outcomes, feedback practices, etc. The learner's learning environment includes the learner's characteristics (age, gender) prior experience, abilities (individual differences), methods and techniques for scheduling and organizing exercises, skill features, motivation and spatial organizational options for the learning environment linked to organizing the learner's activity performance, etc.

It appears that the element that determines the use of a specific model over others is the educational situation the characteristics of the students their needs and the environment of the educational content that is intended to be achieved with the students.

"Using strategies in teaching means taking into account all the possibilities and alternatives available to achieve planned educational goals."

Tennis is one of the games that has gained popularity and a large following for playing and watching its exciting and thrilling matches. It relies on mastering motor skills given the high level of physical, technical and tactical preparation required by this game as well as psychological and educational preparation in order to reach the needed level of performance.

Therefore, it has become crucial for the teacher to choose the best methods, techniques and suitable educational models for teaching in order to reach the set goals in the fastest time and with the least effort.

From this starting point the researcher embarked on a renewed applied scientific endeavor in this field depending on expert opinions and available research and studies specializing in teaching methods and techniques. The hope is to present fruitful teaching alternatives and succeed in producing scientific output that strengthens the academic applied scientific research process. This may open new horizons in the use of teaching methods in other forms and enrich the Iraqi library with this modest effort. The significance of the current research depends in:

The model adopts a systems approach to designing the learning environment, defining inputs, processes and outputs This means emphasizing instructional design as an integrated process to achieve unified goals. The model emphasizes the teacher as a designer of the learning environment not merely a transmitter of information, lecturer or memorizer. The teacher is responsible for preparing learning situations, developing teaching strategies,

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organizing work groups, determining the time required for each strategy, organizing and defining the learning space, selecting learning resources and evaluating the outcomes of the learning process.

Through the researcher's presence and work in teaching in secondary schools and by benefit of her practice of tennis through the physical education and sports science curricula and her following of many sports including tennis the researcher noticed that most of the female students do not master the game and its skills as well as the difficulty of learning it in addition to the absence of time in their physical education class and the lack of use of models, methods and teaching techniques to facilitate learning it. Therefore the researcher sought to represent a new method in the field of physical education and its sciences (the Girac-Ely model) which in turn can help them to rely on themselves in setting educational goals for the backhand and forehand stroke skills in tennis for secondary school students. The issue was defined by the following question: Does the (Girac-Ely model) have a positive effect on learning to perform the forehand and backhand strokes in tennis for female students? Developing educational units using the Girac-Ely model focusing on teaching forehand and backhand strokes in tennis and applying these skills to third-year middle school students at Al-Fahoud High School for Gifted Students. Identifying the effect of the Girac-Ely model on students' learning of forehand and backhand strokes in tennis.

The research hypothesized that instructional design using the Girac-Willi model had a positive effect on students' learning of the forehand and backhand strokes in tennis compared to the control group as demonstrated in both the pre-test and post-test.

Methods and Instruments:

The researcher used an experimental approach with two groups (control and experimental) because it was suitable for the nature of the problem and the research objectives. As Ibrahim Raouf (2021) states, "The experimental approach is distinguished from other scientific approaches by its ability to control and regulate many factors that may influence the studied behavior. It also allows for the discovery of methods and results leading to the formulation of the theory and the law." The research population was defined as third-year intermediate school students at Al-Fahoud High School for Gifted Students affiliated with the Dhi Qar Education Directorate, for the 2025-2026 academic year. The total number of students was (71). A lottery method was used to select the sample with (15) students chosen for the control group (15) for the experimental group, and (4) for the pilot study. Thus the percentage of the research sample was (42.25%) of the original research population. The sample was homogenized by conducting homogenization procedures for the research sample members based on the variables of age height and body mass index.

Table1. shows the Homogeneity of the Research Sample in the Variables (Height, Age and Body Mass)

No	Variables	Unit	Mean	Standard deviation	Median	Coefficient

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1	Height	Cm	20٫01	0٫02	19	0.65
2	Age	Year	171٫32	2٫69	168	0٫07
3	Body mass	Kg	66٫53	3٫21	64	0٫45

Tests Used in the Research

The researcher used suitable skill tests for the research sample in tennis, particularly for the forehand and backhand strokes.

The White test for both forehand and backhand strokes.

Test Objective: To measure the accuracy of the forehand and backhand strokes.

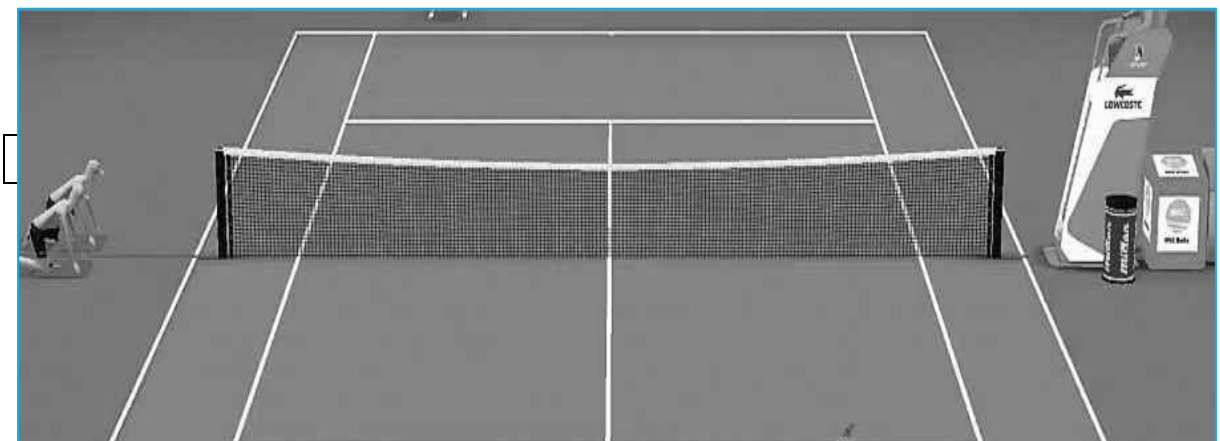
Test Description:

-This test is carried out on a standard tennis court. A racket, a tennis ball, a scoring form and a rope are provided as shown in the diagram, illustrating the test subject's positioning, the test procedure and the scoring system.

- A rope is attached to two posts at the top and bottom of the net, parallel to the net at a height of 7 feet from the ground and 4 feet from the net.

- Three parallel lines are drawn between the service line and the baseline, with a distance of 4.5 feet between the lines. The player stands at the center mark, located at the midpoint of the baseline and is given five practice attempts to assess their performance This is done after receiving instructions from the coach provided the ball is thrown directly over the service line using a pitcher (if available) or the coach. The player then attempts to return the ball with their racket using either a forehand or backhand stroke. Each player is allotted ten forehand and ten backhand stroke attempts. The player's score is the sum of the points earned from these ten attempts. The ball must pass through the net and under the rope. The player receives progressively higher scores from 1 to 5. If the ball passes over the rope half the score is awarded for the correct area it lands in.

***The highest score for the test is 50, and the lowest is 0.**



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Figure (8) illustrates the front and back stroke test.

Scoring: The player's score is the sum of the points he gets from hitting (10) balls with a front or back stroke and the maximum score for the test is (50) points.

Exploratory experiment

Exploratory research means "exploring the surrounding circumstances of the phenomenon that the researcher wishes to study".

The exploratory experiment was carried out on Sunday, (12/10/2025) at (9:00) AM on (4) female students from the research community and lasted (1:30) hours in the tennis court of the school / Dhi Qar Education.

Objective of the exploratory study

➢ Identifying the obstacles that may occur during the implementation of the study and working to solve them and avoid their occurrence.

➢ Preparing training facilities and guaranteeing the suitability and organization of tools and equipment

➢ Ensuring the competence of assistants and training them to execute tests in a standardized scientific manner

➢ Calculation and estimation of the total time in carrying out the tests for each player to establish the total time for the players and the learning unit during the application of the current study on the research sample.

• Conducting the scientific procedures for the tests used.

Field research procedures :

Pre-tests:

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The researcher conducted pre-tests for the research sample from 15-01-2025 to 18-10-2025 All the conditions for the test were fixed and the tests were explained before application so that the research sample could understand the test. The assisting team was present and all test results were recorded.

Main experiment procedures:

After finalizing the pre-tests on the research sample and before explaining the educational units to the students an educational unit was given to the sample on 16-10-2026. After that the special educational units (Girac and Elly model) were implemented for the academic year 2025-2026 for the period from 19-10-2025 until 6-2-2026. The curriculum contain (14) educational units to be implemented during the time of the physical education lesson for the students. They were distributed as (7) educational units to learn the front stroke and (7) educational units to learn the back stroke. After that, (2) educational units were prepared to combine the two skills at a rate of (2) units per week and a time of (45) minutes. The time was divided as follows: (Preparation section (5) minutes main section (35) minutes, and final section (5) minutes. The main section (the educational aspect of the model and the practical aspect of the two skills) was select to be used to apply the Girac-Willi model.

Post-tests:

The researcher conducted the post-tests on the research sample on 14-2-2026, after completing the implementation of the educational units of the curriculum (Girac-Willi model) with (14) educational units. The researcher provided the same conditions under which the pre-tests were conducted.

Statistical methods

The researcher used the Statistical Package for the Social Sciences (SPSS) to procedure the test depending according to the following rules:

✓ Arithmetic mean.
✓ Standard deviation.
✓ The mediator.
✓ Percentage.
✓ Torsion coefficient.
✓ (T.test) for related samples.
✓ (T.test) for independent samples.
✓ Pearson's simple correlation coefficient.

Presenting, analyzing and discussing the results

Presenting the results of the arithmetic means, standard deviation and calculated (t) value for the pre-test and post-test for the experimental group.

The arithmetic means and standard deviation of the pre- and post-tests of research skills for the experimental group are shown.

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Table2. Shows the Arithmetic Means and Standard Deviations of the Pre-test and Post-test for the Research Skills of the Experimental Group

No.	Variables	Unit measurement	Pre test		Post test	
			س	ع	س	ع
1	**Forehand stroke**	Degree	1.62	0.18	2.72	0.26
2	**Backhand stroke**	Degree	1.14	0.27	2.70	0.11

Table3. Shows the Mean Differences (MD), Standard Error (SE) and Calculated t-Values for the Pre-test and Post-test Results of the Skill Variables in the Experimental Group.

No.	Variables	Differences	Differences deviation	Calculated t-Values	Standard Error	Significance
1	**Forehand stroke**	0.69	0.28	5.75	0.001	Significant
2	**Backhand stroke**	1.09	0.29	9.72	0.000	Significant

Presentation and Analysis of the Arithmetic Means, Standard Deviations, and t-Values for the Pre-test and Post-test of the Control Group.

Table4. Shows the Arithmetic Means and Standard Deviations of the Pre-test and Post-test Results for the Forehand and Backhand Tennis Skills of the Control Group.

No	Variables	Unit measurement	Pre test		Post test	
			Mean	Deviation	Mean	Deviation
1	**Forehand stroke**	Degree	1.66	0.42	2.52	0.33
2	**Backhand stroke**	Degree	1.34	0.24	1.70	0.21

Table 5. Shows the Mean Differences (D), Standard Error, and Calculated t-Values Between the Pre-test and Post-test Results for the Skill Variables of the Control Group

ت	Variables	Differences	Differences deviation	Calculated t-Values	Standard Error	Significance
1	**Forehand stroke**	0.93	0.40	4.45	0.000	Significant
2	**Backhand stroke**	1.48	0.44	2.76	0.003	Significant

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3-4 Presentation, Analysis, and Discussion of the Arithmetic Means, Standard Deviations, and Calculated t-Values for the Pre-test and Post-test Results of the Control and Experimental Groups.

Table6. Shows the differences between the experimental and control groups in the post-tests of the research variables.

ت	Variables	Unit measurement	Experimental Group		Control Group		Calculated t-Values	sig	significance
			س	ع	س	ع			
1	**Forehand stroke**	Degree	2.79	0.22	2.47	0.32	1.93	0.000	Significant
2	**Backhand stroke**	Degree	1.79	0.13	1.81	0.23	1.87	0.000	Significant

Discussion:

The current study goal to explain the impact of the systems approach model (the Girac-Ely model) on the achievement and scientific thinking of fifth-grade science students. The Girac-Ely model is based on the premise that the teacher is not merely a transmitter of knowledge a carrier of information, a lecturer, or a memorizer. Rather the teacher is the organizer of the educational process and is responsible for preparing the learning situation, improving teaching strategies, organizing work groups and determining and allocating time. What is crucial for each strategy is allocating the space, equipping its facilities and organizing it as well as

The selection of learning resources as well as the evaluation, whether preliminary or final and in light of the latter

The extent to which the objectives of this situation have been attained can be inferred from feedback.

His analysis of the results acquired from the final assessment

By presenting and analyzing the post-test results for the (forehand stroke, backhand stroke) tests in Table (4) for the control and experimental research groups it became clear that there were significant differences between the tests in favor of the experimental group. The researcher attributes this to several reasons including:

The educational units in the experimental group and the teaching mechanism using the Girac-Willi model for learning the two skills of the forehand and backhand stroke in tennis and through what was presented in presentations and explanations of the two skills in an illustrative manner as this model used in the educational curriculum for the students has clearly contributed to organizing the work and stimulating thinking among the learners in the experimental group. This is what was verified by (McGown, 2000) when she said,

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"The successful completion of learning and the learner's attainment of experience and a good degree of the mechanism takes place before moving on to learning another skill."

The researcher indicates that the superiority that accompanied the experimental group in performing skills over progress in educational units is due to the correct use of educational units. This is what Naheda Al-Dulaimi (2016) indicated: the great variety in exercises and the difference in their conditions which are based on scientific foundations and educational principles which aim to enable the learner to reach the best possible performance in the various activities and events.

The researcher also characteristics these significant differences to the fact that the elements of repetition and variety in the prepared exercises have a great effect on expanding the players' perceptions and concepts in order to understand the skill its ease and clarity as practice and effort in training and continuous repetition are necessary in the learning process.

Practice is a helpful and necessary factor in the process of the individual's interaction with the skill controlling his movements and achieving coordination between the movements that make up the skill in a correct sequential performance and appropriate time. The researcher attributes this superiority in skill performance and its accuracy to the similarity of the prepared particular exercises with the nature of protective skills performance which led to the improvement and development of technical performance its accuracy and clarity of the educational objectives of each educational unit and its harmony with the athlete's level.

The researcher also sees that the experiences and information that learners acquired during the educational units came as a result of the learners' desire and incentive and diversity since the generation of desire and motivation in the learner makes him reach a level of good performance.

The researcher also attributes this superiority in learning to perform the skill of the front and back ground stroke to the suitable application of the vocabulary of the educational units as well as introducing the learner to the type of skill and how to perform each of its forms and the purpose of using it with a description of the conditions under which the learner will perform the motor behavior and providing the learner with skills to deal with the tool and focusing on the mechanics of movement to ensure economy of time and effort.

Conclusions and Recommendations

Conclusions

1- The (Girac-Ely model) is one of the modern models that contribute to resolving many problems during the learning process.

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2- The model contributes to attracting students' attention and engaging them with the needed information and following up on requirements through their awareness of the findings of their responses (feedback).

3- The collaborative teamwork among the students contributed effectively to learning the two skills of the forehand and backhand strokes in tennis for the female students.

4- The method used by the teacher using the (Girac-Willi model) contributed to the speed of the students' learning of the two skills, the forehand and hidden stroke in women's tennis.

5- The use of the (Girac-Ely model) had a good impact on the experimental group which achieved a greater rate of improvement than the control group which works on the traditional method of the teacher.

Recommendations

1- Adopting the Girac-Willi model in teaching some other sports skills and different skills (volleyball, badminton, basketball etc.).

2- The need to introduce assistive tools (visual presentations) in physical education lessons in order to view the parts of the skill in detail to speed up the learning process.

3- administer a similar study using the Girac-Ely model and other teaching models to determine the level of performance and learning in tennis skills.

4- The need to hold training and educational courses for physical education teachers in secondary schools to use the most important models methods and modern techniques that have been introduced into physical education and sports science.

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The Effect of Skill Exercises According to the Advanced Organizers Strategy on Learning Some Basic Skills in Football

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Abstract

This research aims to identify the effect of skill-based exercises designed according to the strategy of advanced organizations in learning some basic football skills among students. The researcher adopted the experimental method using the two-group design (experimental and control) with the application of the pre- and post-tests to measure the level of skill performance of the sample members. The researcher selected the research population, which consists of first-year evening students in the College of Physical Education and Sports Sciences, Al-Mustansiriya University, their number is (106), and it consists of three sections (A-B-C). Section A had 40, Section B had 30, and Section D had 36. The researcher selected Section A as the research sample, which has a number of (40). After the researcher excluded (5) due to non-compliance and excluded (5) students for the pilot study, the sample number became (30) students, and they were divided into two groups, experimental and control, each group having (15) students. Then the researcher determined the percentage of the sample from the population (37.73). After that, he conducted homogeneity of the sample members in some student variables in order to ensure the validity of the tests and tools used in the research. The experimental group was trained using the Advanced Organizations strategy, while the control group used the traditional teaching method. The training program lasted for eight weeks, with two training sessions per week. The results showed statistically significant differences between the pre-test and post-test scores of the experimental group, favoring the post-test. Similarly, the results showed statistically significant differences between the pre-test and post-test scores of the control group, again favoring the post-test. The experimental group also outperformed the control group in the post-test. These results indicate the effectiveness of using the Advanced Organizations strategy in teaching basic football skills.

Keywords: Advanced organizations, motor learning, basic skills, football, physical education.

Introduction

Football is considered one of the team sports that receives great attention worldwide, as it is practiced at various age levels and in educational and sports institutions. This game is characterized by the variety of its motor skills and the diversity of its physical and technical requirements, which necessitates the use of effective educational and training methods to help learn and master these skills. In fact, basic skills of football such as rolling, control and shooting the ball are one of most important pillars that players depend on to be able to implement offensive strategies or defensive during a match (Hazaa, 2024; Saeed et al., 2026).

Football is a team sport with constantly changing motor performance that requires a number of specific physical attributes due to (the large size of the pitch, the long duration

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of the match and/or tactical duties performed both individually and collectively), thus each player needs to possess an optimum level for these attributes along with the basic skills needed for better player performance (Hashim & Naji, 2023: Judah, 2025).

In recent years physical education has experienced significant growth in the ways that modern educational strategies can be implemented to enhance motor learning and help athletes learn sports skills. One of these strategies is the advanced organizers strategy outlined by educational theorist David Ausubel, which directs the learner to identify a global cognitive framework to be used before learning the skill, helping them link this information with previously acquired knowledge (Abdulghani et al., 2025; Abdulghani & Hussain, 2025).

Most research provides evidence that modern educational techniques will enhance motor learning and skilled performance of the learned reveals, since sporting skills are organized and presented in a sequence to aid understanding (Schmidt & Lee; 2019: Mahdi, 2025).

Skill exercises are regarded as one of the most significant teaching methods in football skills due to their role in improving technical performance and developing players' field control (with and without ball) and skill execution (Obeid et al., 2025).

In light of this, the significance of the research is manifested in the effect of skill exercises according to the advanced organizations strategy in learning some basic skills for football by establishing a structured cognitive framework preceding direct implementation supplying with improving rate of motor learning and skill performance (Mufti, 2001: Saleem, & Rashid, 2025).

The advanced organizations' strategy helps in developing technical performance and improving players' ability to execute various skills during play. Therefore, using skill exercises according to a modern educational strategy may contribute to improving the learning of basic skills among players or students (Ali, 2024; Abdulhussein et al., 2025).

This study is titled " The Impact of Advanced Organizational Strategies (Written and Unwritten) on Knowledge Acquisition and Learning Some Offensive Basketball Skills for Students " by the researcher Ghaleb (2021), It aims to identify the effect of advanced organizational strategies (written and unwritten) in knowledge acquisition and learning some offensive basketball skills for students. They used experimental method,first year students in the College of Physical Education and Sports Sciences at Al-Mustansiriya University, accepted for the academic year 2020-2021.Sample. The departments (D, E, F) were chose to represent the research sample. The researcher intends to use three groups, with department D representing the control group and departments E and F representing the experimental groups.

Despite the significant advancements in the field of sports training and teaching methods in physical education, and as the researcher, who teaches football, noticed the students' weak reception of the subject, the researcher decided to attract coaches and sports workers to use modern strategies that help them keep up with the modernity and developments surrounding local and global sports. Additionally, the absence of modern educational strategies may reduce the effectiveness of the educational process and affect the skill performance level of the learners.

Therefore, there is a need to use modern educational strategies such as the advanced organizers strategy, which helps in organizing information and presenting it in a way that

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facilitates the process of motor learning. From here, the research problem is defined by answering the following question:

Does the use of skill exercises according to the advanced organizations strategy contribute to better learning of some basic football skills or not?

The importance of this research lies in several scientific and practical aspects, including:

- Developing methods for teaching basic skills in football.
- Employing a modern educational strategy in the field of physical education.
- Helping teachers and coaches improve the learning level of players.
- Contributing to the development of the educational process in physical education.
- Providing scientific results that can be utilized in the development of sports training programs.

Research aims

- Using skill exercises according to the advanced organizations strategy.
- Identifying the impact of these exercises on learning some basic football skills.
- Comparing the results of the experimental group with the control group.

Research hypotheses

- There are statistically significant differences between the pre-test and post-test for the experimental group.
- There are statistically significant differences between the pre-test and post-test for the control group.
- There are statistically significant differences between the two groups in the post-test, favoring the experimental group.
-

Research fields

Human domain: First-year students in the evening study program at the College of Physical Education and Sports Sciences, Al-Mustansiriya University, accepted for the academic year 2024-2025.

Time frame: 1/9/2025 – 9/11/2025.

The spatial domain is the playground of the College of Physical Education and Sports Sciences at Al-Mustansiriya University.

Research methodology and procedures

This chapter aims to clarify the scientific procedures adopted by the researcher in conducting the study, in terms of determining the methodology used, selecting the research

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community and sample, the tools and tests employed, as well as the steps for conducting the experiment and the statistical treatments used to analyze the data.

Research Method

The researcher adopted the experimental method due to its suitability for the nature of the research problem, as it is considered one of the precise scientific methods aimed at studying the causal relationship between variables thru relative control of the surrounding conditions of the experiment. The researcher used the two-group design (experimental and control) with pre-test and post-test, which is one of the most common designs in educational and sports studies to measure the impact of educational programs (Abdul Fattah, 2010).

Research community and its sample

Research Community

The researcher selected the research community, which consists of first-year evening students in the College of Physical Education and Sports Sciences at Al-Mustansiriya University, totaling (106) students. The community is divided into three sections (A-B-C), with section A having 40 students, section B having 30 students, and section D having 36 students.

Research sample

The researcher, then, chose the research sample in Section A which consisted of (40) students. Upon excluding (5) students because they were not compliant and further excluding (5) students for the pilot study, sample size became (30) students They were selected randomly and they were divided into control and experimental groups (15) students each. The researcher then determined the polynomial sample ratio from the crowded population (37.73). Then the researcher conducted homogeneity tests for a number of variables among members of the sample as seen in table (1).

Table 1. *Homogeneity of the Sample in the Variables of Height, Body Mass, and Chronological Age*

No.	Variables	Unit of Measurement	Mean	± SD	Median	Skewness Coefficient
1	Height	cm	128.57	1.72	1.34	0.05
2	Body Mass	kg	35.56	1.74	34.50	0.06
3	Chronological Age	year	10.53	0.51	10.50	0.95

Devices and research tools

The means and tools used

- Arab and foreign scientific sources and references.
- Personal interviews.
- Exercises.
- The assistant work team.
- Technical performance evaluation form for basic skills tests in football.

The used devices

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The researcher relied on many scientific tools and means needed to obtain the required data and facts thru: (5 soccer balls), (30m leather measuring tape), (3 digital electronic stopwatches), (soccer field), (10 markers), (2 whistles).

Field research procedures

Determining the research variables and their tests

The researcher identified the skills used to conduct the tests on them, which are rolling, ball control, and shooting.

Skill tests

The researcher adopted a set of skill tests that measure some basic skills in football, as shown in Table (2) :

Table 2. *Skill Tests*

No.	Test Name	Type of Test	Objective of the Test	Purpose of the Test	Performance Method	Scoring Method
1	Dribbling Between Cones Test	Skill Test (Dribbling)	Measuring the ability to control the ball while moving	Evaluating dribbling skill and motor coordination	Dribbling the ball between cones as quickly as possible	Time taken (lower is better)
2	Ball Trapping Test	Skill Test (Ball Reception)	Measuring the skill of receiving and controlling the ball	Determining the player's ability to stop the ball accurately	Passing the ball to the player and attempting to control it within a specified area	Number of successful attempts
3	Shooting at Goal Test	Skill Test (Shooting)	Measuring shooting accuracy	Evaluating offensive ability	Shooting balls toward a goal divided into target zones	Scores based on shooting accuracy

The researcher made an adjustment in the method of recording the test to be suitable for measuring the condition whose results are to be known, evaluating performance thru three judges to ensure the objectivity of the tests (Appendix No. 2).

Experimental design

The researcher adopted a two-group design with pre-test and post-test.

The pilot study

The first pilot study

The researcher conducted a preliminary exploratory experiment on a sample from the original research community, consisting of (10) students who will not participate in the main experiment on (1/9/2025), which falls on (Monday). The aim of conducting this experiment was to assess the validity of the devices, understand the extent to which the sample members comprehend the vocabulary and tests, identify the obstacles that the researcher might face when conducting the main experiment, and evaluate the efficiency of the assisting team during their task. The tests were conducted to extract the scientific foundations.

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The second pilot study

The researcher conducted the second pilot experiment on (8/9/2025), corresponding to Monday at 1:00 PM, to clarify the research objective to the sample; to introduce the sample and the assistant team to the working mechanism, and to repeat the tests to understand the scientific foundations, the time allocated for the educational unit, and the number of repetitions needed by the player.

Validity

A valid test is "one that accurately measures the construct it is designed to measure and does not measure anything else instead or in addition to it." Therefore, the researcher used face validity as shown in Table (3).

Reliability

Test reliability means that the test yields the same results when the test is repeated on the same individuals under the same conditions. To calculate the reliability coefficient, the researcher used the test-retest method to find the test reliability coefficient. The tests were applied to a sample of the pilot study and were re-administered after 5 days under the same conditions to obtain the test and retest results scientifically. It was concluded that all the tests had high reliability, as shown in Table (3).

Table 3. *Test Coefficients*

Tests	Reliability (R)	Validity (√R)	Error Level
Dribbling	0.861	0.928	0.002
Ball Trapping	0.846	0.920	0.001
Shooting	0.781	0.884	0.001

At a degree of freedom (9) and a significance level of (0.05).

Field procedures

Pre-tests

The researcher conducted the pre-tests on (13/9/2025), corresponding to (Saturday), on the selected sample.

The main experiment

The exercises used were applied to the experimental group sample on (14/9/2025), corresponding to Sunday at 1 PM, with two educational units per week for a duration of 8 weeks, totaling 16 educational units. The exercises for the experimental group were implemented according to the advanced organizers strategy (non-written) in the lesson designated for the students. The main part of the lesson was conducted, and the lessons included explanations, clarifications, and presentations using a data show for skills and exercises to acquire and store information in memory more quickly. The control group followed the method used by the teacher. The main experiment was completed on (8/11/2025), corresponding to Saturday.

Post-tests

After completing the main experiment, the researcher conducted the post-tests on the selected sample (experimental and control groups) under the same conditions as the pre-tests on (9/11/2025), which corresponds to Sunday.

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Statistical methods

The researcher used appropriate statistical methods to process the data generated using the statistical package (SPSS).

The formulas were as follows:

- Arithmetic mean
- Median
- Standard deviation
- Coefficient of skewness
- Percentage
- (t) test
- Rate of development
- Correlation

Results

Table 4. *Results of the Differences Between the Arithmetic Means and Standard Deviations of the Pre- and Post-Tests for the Control Group*

Variables	Pre-Test Mean	± SD	Post-Test Mean	± SD	Calculated t-value	Improvement Percentage	Error Percentage	Significance
Dribbling	5.61	1.05	5.75	0.70	0.97	2.43	0.014	Significant
Ball Trapping	5.75	0.87	6.50	0.53	3.00	11.53	0.046	Significant
Shooting	5.62	1.06	6.10	1.38	0.56	7.80	0.022	Significant

At a degree of freedom (14), significance level < 0.05.

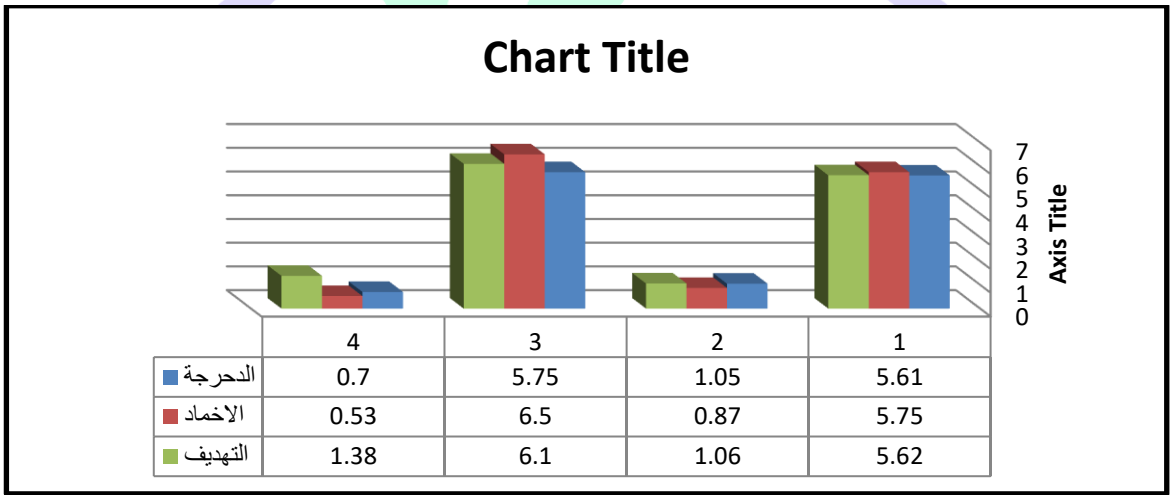


Figure 1. *The graph illustrates the pre-test and post-test results for the control group.*

Discussion of the pre-test and post-test results for the control group

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Thru the results of Table (4), significant statistical differences were found in favor of the post-tests in the control group, indicating a relative improvement in the level of skill performance. This improvement is attributed to the effect of traditional training, which contributes to performance enhancement thru repetition and practice.

Table 5. *Results of the Differences Between the Arithmetic Means and Standard Deviations of the Pre- and Post-Tests for the Experimental Group*

Variables	Pre-Test Mean	± SD	Post-Test Mean	± SD	Calculated t-value	Improvement Percentage	Error Percentage	Significance
Dribbling	5.62	1.06	6.62	0.74	0.79	15.10	0.632	Significant
Ball Trapping	5.87	0.83	7.62	0.91	3.00	22.96	0.243	Significant
Shooting	6.00	0.75	7.12	1.24	0.56	15.73	0.699	Significant

At a degree of freedom (14), significance level < 0.05.

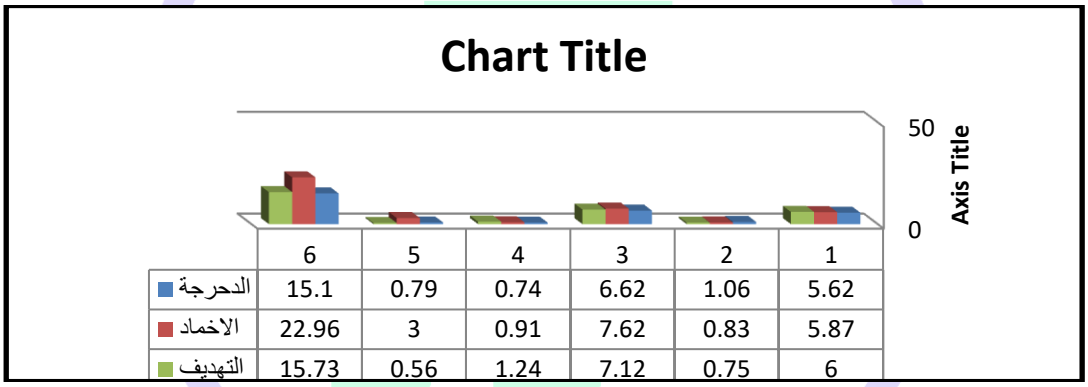


Figure 2. *The graph shows the pre-test and post-test results for the experimental group*

Discussion

Thru the results of Table (5), it was found that there are statistically significant differences between the pre-test and post-test in favor of the post-test for the experimental group. The researcher attributes these differences to the effective use of the advanced organizations strategy, as the goal of this strategy is to develop and improve performance levels and accelerate the learning process.

This was confirmed by (Abdul Hussein, 2014) that students, especially beginners, need to use advanced organizers to make the understanding and learning process more exciting, engaging, and enjoyable, moving away from the routine in educational and rhythmic lessons. This makes the subject they study clearer, more meaningful, and more beneficial because advanced organizers can simplify the learning process, make the educational content more familiar, and develop various cognitive levels (Waleed Abdulkareem & Sattar Jabbar, 2025; Abdulkareem et al., 2025).

The researcher agrees with what was stated by (Zayer et al., 2014) that in this organizer, existing knowledge is also organized, and new experiences are considered to help

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find similarities. This achieves a balance for students that helps them develop their abilities and experiences. The knowledge acquired by the student consists of facts, concepts, and raw cognitive data available to the learner in the plan, which Ausubel calls the "cognitive structure." The nature of the new learning materials that an individual is exposed to varies in terms of their reasonable and comprehensible connection to the cognitive structure. This connectivity leads to what Ausubel calls meaningful learning (Fouad Abu Hatab, Sadiq, 1996).

Conclusions

1- The skill exercises according to the advanced organizers strategy contributed to improving the learning of basic football skills, as the experimental group showed a clear improvement in the level of skill performance compared to its results in the pre-test, indicating the effectiveness of this strategy in developing motor learning.

2- The experimental group outperformed the control group in the post-test, indicating that the use of advanced organizational strategies was more effective than the traditional method in teaching skills, as it relies on organizing information and presenting it in a way that helps the learner understand and comprehend.

3- The presence of relative improvement among the control group members, indicating that traditional training contributes to the development of skill performance, but this improvement was limited compared to the experimental group.

Recommendations

1- Conduct similar studies on different games
2- Conducting similar studies for ages that suit such studies

Acknowledgements

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Appendices

Appendix 1. *Names of the Assistant Work Team*

No.	Name	Occupation	Academic Qualification
1	Assist. Lecturer Idris Jabbar Qasim	Lecturer	Al-Mustansiriya University / College of Physical Education and Sports Sciences / Master's Degree
2	Assist. Lecturer Ihab Ahmed Nouri	Lecturer	University of Baghdad / College of Physical Education and Sports Sciences / Master's Degree
3	Raad Saad Rabee	University Teacher	Al-Mustansiriya University / College of Basic Education / Department of Physical Education and Sports Sciences

Appendix 2. *Names of the Experts*

No.	Name	Occupation	Academic Qualification

1	Assist. Lecturer Haider Hussein Saleh	Lecturer	Al-Mustansiriya University / College of Physical Education and Sports Sciences / Master's Degree
2	Assist. Lecturer Osama Mundhir Hussein	Lecturer	Al-Mustansiriya University / College of Physical Education and Sports Sciences / Master's Degree
3	Assist. Lecturer Abbas Hussein Khalifa	Lecturer	Al-Mustansiriya University / College of Physical Education and Sports Sciences / Master's Degree

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The Effect of a Rehabilitation Program Supported by TAE-BO Exercises on Certain Coordinative Abilities Among Tennis Players with Ankle Ligament Tears

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Abstract

The present study aims to design a rehabilitation program using modern techniques, namely Tae-Bo exercise, to explore its effects on some coordinative skills and ankle ligament tear rehabilitation. The researcher assumes that there are statistically significant differences in favor of the post-test. The experimental method using a single-group pre-test and post-test design was used because of its appropriateness to the research problem. The study population includes tennis players in Karbala clubs with ankle ligament tears. A sample of (4) injured players was chosen after professional medical assessment. The research variables were identified after a comprehensive search through scientific literature. In collaboration with his expertise, the researcher chose the relevant tests for the variables, carried out a pilot study on two subjects, and completed pre-tests following all formal procedures. The main experiment continued for (8) weeks, including Tae-Bo exercises in three rehabilitation units per week, each lasting (45) minutes. After the experiment, post-tests were conducted, and data were collected and organized in statistical tables for analysis and discussion. The results reveal statistically significant differences in favor of the post-test, reflecting a significant improvement after applying the rehabilitation program. Nevertheless, there is a need for further studies using a control group design to validate causal associations. The researcher suggests combining these exercises with mechanical modalities for the rehabilitation of other injuries.

Keywords: Rehabilitation Program, Tae-Bo Exercises, Coordinative Abilities.

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Introduction

Owing to the nature of lawn tennis and the movement patterns involved, whether in a match or in training, these movements require a high level of exertion from the muscular system of the body, especially the lower limbs, in addition to the high pressure exerted on the joints. The fundamental skills of this sport are core components that are always sought to be improved by the coaches; they involve a range of strokes and turns of the body, depending on the rapid movement required to reach the various landing points of the ball. Therefore, the legs are responsible for all the movements in line with the play requirements. Therefore, the joints and leg movements should be strong enough to support the body weight during these movements, without ignoring the role of the supporting leg during the execution. The researcher agrees with (Ahmed, 2007) that although fundamental skills appear simple at the initial stages, they require a lot of effort to be executed, requiring that the player has high coordination levels appropriate for the nature of the game.

TAE-BO training is recognized as the best fitness program and a form of aerobic exercise. It is widely practiced owing to its outstanding and varied motor types, which greatly enhance muscular power, flexibility, reaction time, balance, and neuromuscular coordination, besides increasing the player's self-confidence (ASE, 1999). It is stated that regular compliance with these exercises bears a significant effect on increasing players' physical efficiency in terms of endurance, strength, agility, and balance, which enhances neuromuscular coordination of the legs (Lauren and Vinopal: 2024). The researcher argues that these exercises can be used in the rehabilitation process following an injury, owing to the emphasis on flexibility, which increases the range of motion (ROM) of the legs, thus highly preventing injuries.

The link between coordinative abilities and physical/skill-related factors makes them a necessity for success in all sports-related activities. These abilities do not occur in a separate manner but are interrelated, leading to the coordination of gross and fine motor skills. It is stated that the greater the coordination of these abilities, the greater the ability of the player to reach the highest level of motor coordination. Thus, the difference in levels of motor ability is dependent on the player's accuracy and skill (Kamil and Ibrahim, 2005).

In some movements, the body performs signals related to "inhibition" or not acting until the right time. This inhibition is related to the proper use of energy and its proper direction. In this state of "alert stillness," the player has a complete field of attention, noting the conditions experienced in these movements. Otherwise, they may feel that stillness is related to over-exertion or a collapse leading to energy loss. Coordinative abilities are a set of requirements for the processes of control, coordination, and organization of motor activity by the Central Nervous System (CNS) to improve the ability to perform complex motor skills quickly and accurately with less effort (Zahradnik, 2012). Despite the fact that ankle ligament injuries are most common among tennis players, there is a lack of research studies related to the integration of Tae-Bo into rehabilitation programs to enhance coordinative abilities. This leads to the need for an experimental study to confirm the effectiveness of these interventions, which emphasizes the significance of the present study.

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While various rehabilitation programs exist, a common goal of returning the injured player to the field as quickly as possible is shared among them all. Statistical reports indicate that ankle ligament injuries represent approximately 20–30% of sports injuries in games requiring rapid changes of direction. This underscores the need to develop rehabilitation programs that enhance neuromuscular control and coordinative abilities. Through the researcher's observation, most training regimens for tennis players lack the coordinative aspects that improve neuromuscular harmony, especially since the nature of the sport demands such abilities to avoid erroneous movements that lead to injuries, most notably ankle ligament tears. Therefore, the researcher sought to develop and utilize Tae-Bo exercises for the rehabilitation of this specific injury.

The Research Objectives

1.To design a rehabilitation program supported by Tae-Bo exercises.

2.To identify the effect of this Tae-Bo-supported program on the rehabilitation of ankle ligament tears.

3.To identify the effect of the program on developing certain coordinative abilities in patients with ankle ligament tears.

The Research Hypotheses

There are statistically significant differences between the pre-test and post-test measurements in favor of the post-test.

Definition of Key Terms

Tae-Bo Exercises: A modern fitness program style practiced to improve physical fitness and benefit the body's vital systems (Basmat, 2006).

Methodology

Research Design and Field Procedures

The researcher employed a one-group with pretest-posttest experimental design, as it is the most appropriate for the nature of the present study.

The Research Population and Sample

The population for the study includes (7) players from Karbala clubs suffering from ankle ligament tears. After a clinical examination by a specialist physician to identify the nature and extent of the injury through Magnetic Resonance Imaging (MRI), it was revealed that three players did not suffer from ankle ligament tears. Thus, the sample was limited to players with second-degree ligament tears who had not participated in any previous rehabilitation program within the last three months. The final research sample included (4) players .

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Data Collection Tools and Equipment

1. Data Collection Tools

1. Scientific references and literature.

2. Interviews .

3. Internet resources .

2. Equipment and Devices

1. Magnetic Resonance Imaging (MRI) .

2. Infrared radiation therapy device .

3. Samsung camera (Korean made) .

4. Color-coded resistance bands .

5. Benches .

6. Various free weights .

7. Rubber balls .

Identification of the Research Variables

The researcher identified the research variables by scanning some previous studies related to the current study, such as (Ahmed, 2021; Abdulmaqsoud and Abdulaziz, 2024; Kilani, 2024). The variables included coordinative abilities, namely:

- Eye-foot coordination.
- Dynamic balance.
- Speed of movement.

Selection of Appropriate Tests

In order to establish a mechanism for selecting appropriate tests for the sample members, the researcher selected tests that are compatible with the type of injury. This was done to evaluate the ability of the patients to perform some tasks, which will enable the researcher to design a rehabilitation program based on scientific foundations that are compatible with the type of injury. The tests are defined as follows:

1. **Dynamic Balance Test: (Filipa, 2010).**

Purpose: To assess dynamic balance (Star Excursion Balance Test - SEBT pattern).
Tools: Flat surface, measuring tape, floor adhesive tape.
Procedure: The subject stands with the affected leg (supporting leg) at the midpoint. The subject is asked to reach as far as possible with a gentle touch using the big toe of the unaffected leg, and then bring the leg back to the initial position while keeping the balance of the supporting leg. The exercise is done in the Anterior (A), Posteromedial (B), and

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Posterolateral (C) directions. In the posterolateral direction, the unaffected leg passes behind the supporting leg. In the other directions, it passes in front of the supporting leg. The subject is given (6) practice trials for each direction, followed by a (5-minute) rest, and then (3) trials are recorded for each direction. If there is any loss of balance or excessive weight-bearing on the unaffected leg the trial is considered invalid.
Scoring : The distance (cm) from the center to the furthest point touched is recorded for each required direction .

2. **Numbered Circles Test (Salloum, 2004)**

Purpose : To measure eye-foot coordination .

Tools: Stopwatch , eight circles drawn on the ground (60 cm diameter each) numbered 1-8 .

Procedure: The participant stands in circle (1) . On the start signal they jump with both feet together sequentially to circles 2 , 3 through 8 at maximum speed .

Scoring: The total time taken to complete all eight circles is recorded .

3. **Movement Speed Test (Clark, 2001)**

Purpose: To measure movement speed (Lateral Hop Test) .

Tools: Flat ground , white adhesive tape (15 cm width) .

Measurement Unit: Seconds/Repetitions .

Procedure : The participant stands behind the starting line on the injured leg and begins jumping laterally across the 15 cm wide line landing on the same leg . If the foot touches the line the trial is invalid . Two trials are given ; the best one is recorded .

Scoring: The number of successful hops completed within (10) seconds is recorded .

Pilot Study

The pilot study functions as a small-scale trial that replicates the conditions of the main experiment. Therefore, the researcher conducted the pilot study on June 3, 2025. The aim of the pilot study was to check the validity of the rehabilitation exercises, the appropriateness of the exercises to the sample, the time taken to perform the exercises, and the time taken for the testing procedures.

Pre-tests

After the specialist physician verified the recovery of the participants and the reduction of pain in the ankle joint, the researcher carried out the pre-tests on June 5, 2025. The tests were carried out at the tennis grounds of the Faculty of Physical Education and Sports Sciences in Karbala.

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Main Experiment (The Rehabilitation Program)

The researcher conducted the main experiment on TAE-BO training based on a studied mechanism. The training was divided into two phases:
Phase I (4 weeks): In this phase, emphasis is placed on the use of resistance bands to improve the strength of muscles around the ankle joint, in addition to body weight resistance exercises to enhance the load on the joint. This phase included passive and active flexibility exercises to improve Range of Motion (ROM). Most of the exercises were based on neuromuscular coordination, which aimed at achieving dynamic balance and optimal muscle activation (agonist-antagonist coordination) to promote energy-efficient movement. Intensity was maintained at 60-70% of maximum repetition .
Phase II (Final 4 weeks) : In this phase , progressive weights were added to improve the strength of muscles that had become inefficient due to atrophy during the injury period . Tae-Bo training continued along with these weights which targeted supporting muscles and prime mover muscles.

Program Parameters

Total Duration: 8 weeks .

Frequency: 3 sessions per week (Sunday , Tuesday , Thursday) .

Session Duration: Each session lasts for 45 minutes .

Intensity: Gradual increase reaching 75-80% with careful coordination of volume and rest periods .

Post-tests

The post-tests were carried out on September 28, 2025 to ensure that the same conditions were met as in the pre-tests thus ensuring internal validity .

Statistical Analysis

The data was analyzed using the SPSS package, employing the following:

1. Mean .
2. Median .
3. Standard Deviation .
4. T-test .

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Results

Table 1. *Means, Standard Deviations, and Calculated (t) Values for Selected Coordinative Abilities*

No.	Variables	Unit	Pre-test (M±SD)	Post-test (M±SD)	t-value	Sig. (p)	Significance
1	Dynamic Balance	cm	1.89 ± 1.65	0.34 ± 0.46	2.56	0.000	Significant
2	Coordination	sec	8.56 ± 2.49	6.43 ± 1.27	2.77	0.000	Significant
3	Motor Speed	degree	14.76 ± 2.66	11.23 ± 1.19	2.97	0.001	Significant

Results are considered statistically significant when the p-value is (Sig ≤ 0.05), at degrees of freedom of (n - 1) = 4 - 1 = 3.

Discussion

Table (1) reveals that there are major differences between the pre-test and post-test results in favor of the post-test for all the research variables. The researcher relates this positive change to the rehabilitation program enhanced by Tae-Bo exercises. These findings indicate the appropriateness of these exercises to the nature and intensity of the injury, as the gradual transition from simple to complex movements had a positive effect on the research sample. Moreover, the structuring of the program duration based on scientific criteria and appropriateness to the exercises had a major effect on the experimental group, resulting in a dramatic positive change in the coordinative capabilities being examined. The researcher also gives credit to the utilization of specialized tools that had a major positive effect on the muscular strength of the muscles involved in the ankle joint, hence affecting the ligaments that were previously injured. The emphasis on both the supporting and agonist muscles had a major positive effect on the improvement of the motor component and neuromuscular coordination. The Tae-Bo training had a positive effect on the improvement of total body control and increasing the capacity to produce power and speed in the direction of movement (acceleration and deceleration) while maintaining balance. Quick changes in body positions, along with proper spatial awareness and perception, are major requirements for this sport.

The researcher states that the enhanced coordinative capabilities later strengthened the muscles of the ankle joint for balance, flexibility, and strength. This is in line with Blanks (2006) who argues that Tae-Bo is an integrated and continuous program that enhances physical fitness and technical skills by relating to the motor pathways of different specialized sports activities.

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Methodological Focus: Phase I and II

During the first four weeks, the researcher concentrated on strengthening the ligaments around the ankle joint to withstand the requirements of competitive play. In tennis, there is multi-directional movement, where the ankle joint supports the weight of the entire body during all movements and turns. The possession of coordinative capabilities enables the player to cope with different performance requirements; since the conditions of competition in tennis are constantly changing due to the ball and the opponent, coordinative capabilities are the main mechanism for motor control. This enables the player to attain optimal coordination and performance, as indicated by Dollar and Muhammad(2014) .

During the second four weeks, the researcher combined different weights, such as medicine balls and BOSU balls (half-rubber balls attached to the floor). The aim was to strengthen the agonist muscles of the ankle joint and the ligaments. The focus was on exercises that target static, dynamic, supporting, and antagonist muscles for all movements that simulate the sport. The intensity, volume, and recovery time of the exercises were adjusted according to the nature of the injury.

Biomechanical Mechanisms

Most of the exercises involved the mechanism of "Alert Stillness" (Vigilant Isometrics). These injuries need a state of stillness in which the patient is alert and concentrates on the inhibition of certain muscle groups and the activation of others. This aspect makes the Electromyography (EMG) activity of the muscles maximal and improves neuromuscular coordination around the ankle joint. The inhibitory impulses ensure that nothing happens until the right time, involving accurate energy control and guidance. The researcher has also used the aspect of mass of the subject in the rehabilitation process. The presence of force does not necessarily mean the presence of motion because force can be a change or an attempt to change the kinetic or structural state of the body. An applied force may not be able to overcome the inertia of the body and thus may not bring about the desired change (Ahmed, 2023).

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Analysis of Coordinative Variables

The findings of the present study reveal positive changes in the following areas:
Neuromuscular Coordination: There was an improvement in absolute strength (muscle strength irrespective of body weight). Since technical skill involves maximum absolute strength, where all muscle groups (not only flexors or extensors) are involved in the movement, the researcher stresses the importance of this overall involvement.
Kinetic Balance: Tae-Bo training increased the strength of the flexor and extensor muscles of the joint. This increased strength enables the patient to control their movements in all directions, which in turn increases the ability to control the free leg and the supporting leg during technical skill performance (Farhan and Al-Mu'min, 2025).
Motor Speed and Agility: Training included agility exercises that originated from increased strength in the legs. In tennis, high agility is required because of the positions of the body during play, which involve multi-directional movements, bending, and turning while maintaining speed and balance. Hence, the research hypothesis is accepted.

Conclusions

1. The rehabilitation program with support from Tae-Bo exercise has a significant effect on rehabilitating the ligaments of the ankle joint.
2. Tae-Bo training has a positive effect on the studied coordinative abilities.
3. The Alert Stillness mechanism is effective in rehabilitating the tear in the ligaments of the ankle joint and improving specific coordinative abilities.
4. The combination of Tae-Bo training and the Alert Stillness mechanism led to a significant improvement in the studied research variables.
5. The results of this study indicate that Tae-Bo training can be effectively used in rehabilitation programs.

Recommendations

1. Modern training methods, such as Tae-Bo training, should be used in rehabilitation programs.
2. Exercise programs should be designed according to the specific biomechanical mechanism of the injury.
3. The Alert Stillness mechanism should be applied to the rehabilitation of other joints in the body.
4. Future studies should be carried out with larger samples and more experimental designs to further confirm the findings.

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The Effect of a Combined Training Program (Aquatic–Trampoline) on Functional Efficiency, Dynamic Balance, and Breaststroke Swimming Performance in Women Aged 45–50 Years

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Abstract

This study aimed to develop a combined aquatic and trampoline training program and to investigate its effect on functional efficiency, particularly heart rate recovery after exertion, dynamic balance and breaststroke performance, among female swimmers aged 45–50 years. The researcher employed a single-group experimental design with pre- and post-tests. The sample include eight female swimmers purposively choose from Top Level swimming pool. The training program lasted eight weeks comprising three training sessions per week for a total of 24 sessions. It included both aquatic and trampoline training following a progressive training load principle. Data were gathered using the functional efficiency test (heart rate recovery after exertion) the revised Bass test for dynamic balance and a 50-meter breaststroke performance test. The findings were statistically analyzed using the mean, standard deviation and paired-samples t-test at a significance level of $p \leq 0.05$. The results presented a significant improvement in all research variables. The functional efficiency index increased from (17.00 ± 1.31) to (25.00 ± 1.31), representing a 47.06% improvement. Dynamic balance increased from (35.50 ± 2.45) to (40.50 ± 2.45), a 14.08% improvement. Conversely the time for the 50m breaststroke decreased from (65.25 ± 3.96) seconds to (61.75 ± 4.11) seconds, a 5.36% improvement. All differences were statistically significant ($p < 0.05$). The researcher concluded that combined training (aquatic-trampoline) is an effective training method for improving functional efficiency, dynamic balance and breaststroke performance levels among women swimmers in this age group.

Keywords: Aquatic training, trampoline, functional efficiency, dynamic balance, breaststroke

Introduction :

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The field of sports training is witnessing continuous enhancement in the use of modern training methods aimed at improving physical, functional and skill-based abilities across different age groups. The use of combined training programs has become a modern trend in sports training science due to the diverse training stimuli they provide, which contribute to more effective physiological and motor adaptations compared to traditional methods. The significance of these programs is particularly evident for middle-aged women as this stage is accompanied by a range of physiological and functional changes that gradually affect the efficiency of vital systems and motor abilities. This in turn impacts physical and skill performance and participation in different sports activities. many researchers demonstrate that the use of combined training programs has become a modern trend in sports training because it offers diverse training stimuli that contribute to improving physical and skill-based abilities and creating more effective functional and motor adaptations compared to traditional methods (Ibrahim & Ali, 2026).

Aquatic training is one of the most appropriate training methods for this age group due to the unique properties of the aquatic environment. These properties decrease pressure on the joints and spine caused by buoyancy and provide natural resistance for movement in all directions. This helps improve muscular strength, endurance and the functional efficiency of the circulatory and respiratory systems, while mitigating the likelihood of injuries or physical strain. Furthermore exercising in water improves cardiovascular and respiratory efficiency by increasing oxygen delivery to working muscles and enhancing the body's capacity to sustain performance for longer periods. This makes aquatic training an effective way to improve functional and motor skills in middle-aged women Studies have indicated that aquatic training contributes to developing physical abilities and improving functional efficiency due to the natural resistance of water and the ability to regulate the intensity of the workout to suit the nature of the movement It important role in raising performance levels and improving functional and muscular adaptations (Raouf Mahmoud & Yasir, 2024).

In other hand trampoline training is a modern training method that depends on performing rebounding movements and repeated jumps requiring a high degree of neuromuscular control to maintain body balance during performance. These exercises contribute to activating sensory receptors, improving vestibular function and developing neuromuscular coordination and kinesthetic awareness They also play a role in developing dynamic balance which is a fundamental requirement for many sports activities (Zayed & Shehata, 2019; Kamil & Sheet, 2024). Furthermore the flexible surface of the trampoline necessitates continuous motor adjustments by the trainee to maintain balance leading to improved motor control and rapid response to numerous changes during performance (Sun et al., 2025).

Breaststroke is a swimming style that requires a high degree of coordination between arm and leg movements and breathing as well as a suitable level of functional efficiency and dynamic balance to maintain a streamlined body position in the water and achieve economical performance that lower the energy consumption and improves results Proper breaststroke technique depends heavily on the swimmer's ability to control body position during the transitions between the pull, propulsion and glide phases, making the development of functional abilities and dynamic balance important for improving performance (Ghazwan et al., 2025; Abdulghani & Hussain, 2025).

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In spite of various studies examining the effect of aquatic training or trampoline training alone on the development of certain physical and functional variables research investigating the effect of combining these two training methods on women swimmers aged 45–50 remains limited. This motivated the researcher to design a combined aquatic and trampoline training program to investigate its impact on functional efficiency, dynamic balance and breaststroke performance. The importance of this research depends in the potential to utilize the results of this program in developing training programs for middle-aged women enhancing their functional and motor skills and positively impacting their performance in swimming and various physical activities.

The research goals to develop a combined training program that combines aquatic training and trampoline training, and to identify its effect on developing functional efficiency, dynamic balance and breaststroke performance level among women practicing swimming aged (45-50) years.

The researcher assumes that there are statistically important differences between the results of the pre-test and post-test, in favor of the post-test in the variables of functional efficiency, dynamic balance and breaststroke performance level among the research sample as a result of implementing the combined training program.

The research was limited to a group of women practicing swimming aged (45-50) years in the Top Level swimming pool and the research procedures were conducted during the period from 1/10/2025 until 1/12/2025.

Methods and Instruments

Research Methodology

The researcher used the experimental method because it was appropriate for the nature of the research and the achievement of its objectives. It is considered one of the most suitable scientific methods for studying the impact of the independent variable on the dependent variables by controlling the conditions surrounding the experiment and monitoring the changes that occur as a result of implementing the training program. The researcher accepted a single-group design with pre- and post-tests to identify the effect of the combined training program (water-trampoline) on functional efficiency, dynamic balance and breaststroke performance level among the research sample.

Research community and sample:

The research population was purposively chose from women aged 45–50 years who consistently swim at the Top Level swimming pool. This group demonstrate the target demographic for the study of the combined (aquatic-trampoline) training program The research sample was also purposively selected from this same population consisting of eight women who regularly swim This sample comprised the experimental group that underwent the proposed training program. The participants were chosen based on their similar age, experience level ability to commit to the training sessions throughout the experiment and their good health which allowed them to participate in the training program and take the research tests.

Devices, tools and methods used

1. Arabic and foreign sources and references
2. Educational swimming pool.
3. Trampoline machine.
4. Electronic timers.
5. Pulse measuring device.

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6. Whistle.
7. Measuring tape.
8. Adhesive tape.
9. Data and results recording forms.
10. Electronic calculator.
11. Supporting staff

Tests used in the research

Choosing a method for measuring job performance: (Dewor, 2023)

Test Name: Functional Competency Measurement Test

The purpose of the test is to measure the functional efficiency of the circulatory-respiratory system.

Tools used:

- Stopwatch.
- Pulse measuring device.
- A chair for relaxation.
- Registration form.

Test description: The subject performs physical exertion such as swimming The pulse rate is then measured immediately after the exertion and again during the recovery period after 1 to 3 minutes.

Registration: It was calculated using the following equation:

Functional efficiency = Pulse immediately after exertion - Pulse after one minute.

Dynamic Balance Test: (Halabchi, 2020)

Name of the test: Modified Bass test for dynamic balance.

The purpose of the test: - To measure the ability of the examinees to maintain body balance during movement and transition between the specified marks.

Tools used:

- Adhesive tape to mark the locations of the jumping.
- Stopwatch
- Registration form.
- A flat, non-slip floor

Method of operation:

1- Markers are drawn on the ground according to particular distances.
2- The test subject relies on their preferred foot behind the starting line.
3- It proceeds by positioning the specified marks in sequence.
4 - You must remain still for 5 seconds after each jump.
5 - A point is calculated for each successful attempt with deductions for errors related to loss of balance or touching the ground.

Registration method:

A score is awarded upon successful maintenance of the specified mark (in this test, 10 circles were drawn, each circle worth 5 marks) The maximum mark is 50 marks.

- The higher the degree the better the level of dynamic balance.
- 50m breaststroke swimming achievement test:
- The intention of the test: - To measure the time it takes to cover a distance of 50 m breaststroke at maximum speed.

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- Tools used:-

Stopwatch, whistle, form, registration.

Performance description:

The swimmer persists on the starting board, taking the appropriate ready stance and upon hearing the whistle, the swimmer jumps into the water, attempting to encompass the distance with maximum effort until reaching the final edge of the mentioned distance.

- Laboratory degree: minutes, seconds and fractions thereof.

Exploratory experiment

The researcher carried out the exploratory experiment on Wednesday, 1/10/2025 on a sample of (2) women practicing swimming from outside the research sample with the goal of confirming the validity of the tests and tools used knowing the time need to implement them and identifying the difficulties that may be faced in implementing the main experiment and working to address them as well as organizing the work of the support team and the mechanism for recording the findings.

The researcher was careful to establish specific conditions for the tests in terms of place, time, tools used, method of implementation, and the assisting team to ensure the accuracy of the results.

Pre-tests

The researcher conducted pre-tests for the research sample before commencing the training program These tests took place on Saturday, October 4, 2025, and Monday, October 6, 2025, and included functional competency tests, dynamic balance tests and a 50-meter breaststroke swimming performance test The researcher confirmed that all participants received the same testing conditions in terms of location, time, equipment and method of execution to guarantee accurate and reliable findings that could be compared with the post-test results.

Training program

The researcher designed a combined aquatic and trampoline training program, tailored to the research objectives and the nature of the study sample to develop functional efficiency, dynamic balance and breaststroke performance among women aged 45–50. The exercises were developed based on pertinent scientific sources, references, and prior studies as well as the researcher's experience in sports training. The program was then reviewed by a group of experts and specialists to confirm its suitability and appropriateness for the research sample.

The training program lasted eight weeks with three training sessions per week on Saturdays, Mondays and Wednesdays, for a total of 24 training sessions. Each session lasted 60 minutes and was separated into different sections (Appendix 1).

The researcher based the determination of training load intensity on scientific recommendations for physical activity and aerobic training in middle-aged adults These recommendations suggest that a moderate intensity (50–75% of maximum heart rate) is safe and effective for developing functional efficiency, cardiorespiratory capacity and motor balance in non-athletes or those who regularly engage in physical activity while decreasing the risk of fatigue and injuries associated with high loads. This intensity is also acceptable for the physiological characteristics of women aged 45–50 allowing for gradual functional adaptations in the circulatory and respiratory systems while maintaining the integrity of vital organs and the participants' ability to continue the training program The researcher adopted

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the principle of progressively increasing training load based on the principles of sports training which emphasize the necessity of moving from low to moderate and then relatively high intensities to ensure the required physiological and motor adaptations and achieve appropriate training response (American College of Sports Medicine [ACSM], 2024; Gibson et al., 2024).

The training session included three main parts The introductory part included general and specific warm-up exercises, stretching exercises and joint mobilization exercises lasting 10–15 minutes The vital part lasted 35–40 minutes and included a sequence of trampoline exercises such as vertical jumps, jumps with a change of direction, jumps with open and closed legs and balance exercises after landing It also included a series of breaststroke exercises of varying intensity, focusing on improving motor balance, functional efficiency and skill performance. The concluding part lasted 5–10 minutes and included light swimming and cool-down and relaxation exercises to progressively return the body's systems to their normal state.

When implementing the program the researcher considered the principles of continuity, gradual progression, individual differences and training safety in a manner appropriate to the characteristics of women at this age while highlighting the gradual transition from low to high loads to ensure the achievement of the training program's objectives and the attainment of the best possible functional and motor adaptations.

Post-tests

The researcher carried out the post-tests for the research sample after the completion of the (8) week training program on 1/12/2025 using the same tests tools and procedures that were used in the pre-tests taking into account the constancy of all conditions connected to the testing process to ensure the accuracy of the contrast between the results of the pre-test and post-test and to know the extent of the development that took place in the research variables.

Statistical methods

The researcher implemented the Statistical Package for the Social Sciences (SPSS) to process the research data and extract the findings. The arithmetic mean and standard deviation were used to describe the research sample data as well as using the T-test for correlated samples to detect the significance of the differences between the results of the pre-test and post-test in the research variables A significance level of (0.05) was adopted to judge the significance of the results.

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Table1. Showing the results of the arithmetic mean, standard deviation, calculated t-value and significance level for the pre-test of the research variables

Statistical Significance	Significance	(T)	Post test		Pre test		Unit of measurement	Variables
			SD	Mean	SD	Mean		
Significant	0.000	13.00	1.31	25.00	1.31	17.00	Beats/min	Functional efficiency
Significant	0.000	14.00	2.45	40.50	2.45	35.50	Degree	Dynamic balance
Significant	0.000	7.07	4.11	61.75	3.96	65.25	Second	Breaststroke time performance 50m

Significant at (0.05).

Discussion:

The research results presented a crucial improvement in functional efficiency among women aged 45–50 who practiced swimming indicating the effectiveness of the proposed program in improving the efficiency of the cardiorespiratory system during physical exertion This is attributed to the nature of the exercises used which combined the aerobic element in the water with dynamic balance on a trampoline All of this led to the improvement and adaptation of the body's functional systems. This related with Wajih Mahjoub's opinion that aquatic training contributes to improving the efficiency of the cardiorespiratory system as swimming needs water resistance which in turn raise the workload of the heart and lungs. These adaptations improve oxygen delivery to the working muscles and decrease fatigue during performance which is indicated in the higher functional efficiency index in the post-test. (Bosetto et al., 2025).

In contrast trampoline training also helped to activate the neuromuscular system and develop heart efficiency through intermittent exertion as repeated jumps require quick responses between the nervous and muscular systems resulting to improved functional endurance and faster recovery between exertions (Aslam et al., 2025).

The researcher agrees with Gibson et al (2024) that combining aquatic training and trampolining created a variety of intensity and training environment which assisted to bring about physiological adaptations involving the circulatory, respiratory and muscular systems and this in turn improves functional efficiency. Also practicing swimming, particularly breaststroke, at a moderate intensity is considered one of the aerobic systems that raises the efficiency of the heart and lungs especially with this research sample of the age group (45-50 years) as it helped them to develop the economy of effort and lower energy consumption during performance (Chen et al., 2024).

From the table above the findings of the dynamic balance test indicate significant differences between the pre-test and post-test and the post-test is valid. The researcher features this development to the prepared training program that contributed to the development of dynamic balance in the research sample through the development of neuromuscular coordination and complex control. This is consistent with Sun's statement that trampoline training consists of rebounding movements and repeated jumps that need the trainee to continuously maintain the body's center of gravity during performance which

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leads to raised efficiency of neuromuscular control and improved balance during movement (Sun, et al, 2025).

Training on a relatively flexible and unstable surface such as a trampoline requires continuous adjustments to the movement in order to maintain performance and stability In this way it contributes to the improvement of the vestibular system and motor senses which show their positive development on dynamic balance cause of the adaptation of the nervous and sensory systems to the nature of the exercises used (Shehata, 2019) It must also be observed that the aquatic environment helps to decrease the pressure on the joints while continuing to provide resistance to the movement.

Therefore, water training is considered a safe training especially for middle-aged people as it develops neuromuscular coordination and motor balance (Ries, 2020). As we know breaststroke swimming by its nature requires continuous motor integration between the arms and legs while maintaining horizontal flow of the body in the water. This leads to the development of control over body movement and strengthening of its muscles especially those responsible for balance and stability, particularly the trunk, abdominal and back muscles (Fantozzi, et al., 2022).

The researcher also believes that her work in combining trampoline training and breaststroke swimming has contributed to providing diverse motor stimuli, as trampoline training has contributed to the development of the muscular system and breaststroke swimming has helped with muscle control and the development of motor coordination. This combination and integration between the two trainings has led to the development of the sample's ability to maintain balance during movement and mobility.

From the same table we observe an improvement in the time spent performing breaststroke for the sample, which is of course a result of the development in functional efficiency and dynamic balance. This is due to the effectiveness of the training program that combined trampoline training and aquatic training, which is important in developing the motor and basic abilities associated with breaststroke performance. As we have observed trampoline training has clearly contributed to developing dynamic balance and neuromuscular coordination as it consists of continuous jumping movements, changing body positions and the body's ability to control the center of gravity. This in turn was reflected in the performance in the water by improving stability during leg movements. In contrast the aquatic training that was used contributed to the development of physical abilities especially specific strength and strength endurance as the continuous water resistance during movement activated the working muscles in a manner appropriate to the ages of the sample. Aquatic training reduces pressure on the joints, which helped them to continue training and repeating, and improve functional and motor efficiency without fatigue and exhaustion.

This is consistent with Verrelli's assertion that breaststroke requires high coordination between the arms and legs with appropriate timing between pull and glide (Verrelli et al., 2023). Therefore, the program contributed to the enhancement of neuromuscular coordination which in turn was reflected positively on the performance time of the breaststroke for the sample. Talha stated that "the variety in training stimulation contributes to increasing the efficiency of motor performance" (Lafe & Newell, 2022).

Conclusions:

- The integrated training program (water-trampoline) implemented for (8) weeks contributed to improving the functional efficiency interduced by the heart rate recovery

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index after exertion in women practicing swimming aged (45-50) years from the research sample.

- The combined training program significantly improved the dynamic balance of the research sample as evidenced by the higher scores on the modified Bass test for dynamic balance in the post-test compared to the pre-test.
- The research sample reached a significant improvement in the time spent performing the breaststroke swim for a distance of (50m) after applying the training program compared to the findings of the pre-test.
- The simultaneous improvement in functional efficiency and dynamic balance indicates the potential for merged training (aquatic-trampoline) to contribute to supporting the skill performance requirements of breaststroke swimming among women practicing swimmers within the studied age group.
- The results of this study showed the effectiveness of the combined training program in developing the functional motor and skill variables under study in the research sample contain of women practicing swimming aged (45-50) years

Recommendations:

- Adopting the combined training program (water - trampoline) in training women practicing swimming at middle ages according to its positive impact on developing functional efficiency, dynamic balance and performance level.
- giving attention to the use of water exercises as a safe and effective training method for middle-aged women as they provide suitable resistance while decrease the pressure on the joints.
- Utilizing trampoline training to improve dynamic balance and neuromuscular collaboration in various sports activities and events.
- performing similar studies on different age groups and both genders to verify the effectiveness of the training program in diverse conditions.
- Conducting future studies that address the effect of aquatic and trampoline training on other physical, functional and physiological variables not addressed in the current research.

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Model Training Unit (Aquatic – Trampoline) Participants: Female Recreational Swimmers Aged 45–50 Years

Unit duration 60 : Minutes
Training Intensity 70-60 : Minutes
Warm up part 15-10 : Minutes

Exercise	Intensity	Time
Light walking	%50	Minutes 5
Muscle Stretching Exercises for the Legs, Arms, and Trunk	%50-60	Minutes 5
Joint Exercises (Shoulder – Knee – Ankle)	%50	Minutes 5

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Main part : 35 -40 Minutes

Exercise	Intensity	repetition	Rest between repetition	Sets	Rest
Second Jump on the Trampoline	%60	10	10s	3	6s
Jumping with Legs Apart and Together	%60	10	10s	3	60s
mping with Direction Changes on the Trampoline	%60	10	10s	3	60s
Jumping with Balance Stabilization After Landing	%60	10	10s	3	60s

Exercise	Intensity	Sets	Rest between repetition	Rest between Sets
Slow breaststroke swimming	%50	4(2×25)	60s	90s
Balanced breaststroke swimming	%60	4(2×25)	60s	90s
Complete breaststroke swimming	%65	4(2×50)	90s	120s

Final part 10-5) Minutes

Exercise	Intensity	Time
Cool down in water)very light swimming(	%50	5Minutes
General muscle exercises	lower	3Minutes
Relaxation exercises	lower	3Minutes

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The Impact of Artificial Intelligence Technologies on Improving Physical Fitness Components Based on Physical and Physiological Conditions

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Abstract

This study aims to improve an artificial intelligence (AI) model for training and nutritional analysis and recommendations determine vital indicators related to with fitness components, evaluate the model's effectiveness through a comparative study and establish an applied framework for coaches and specialists. The study employed an experimental approach, measuring the effect of the independent variable (the AI system (K.A.I.N.)) on the relies on variables (fitness components and physiological indicators). The study population consisted of practitioners in clubs and advanced training centers. A purposive sample of 40 elite male and female athletes aged 18 to 25, was randomly separated into two equal groups: an experimental group (n=20) that received the K.A.I.N. system, and a control group (n=20) that followed the traditional program. A range of tools were used including the InBody body composition analyzer, Polar Vantage V smartwatches for monitoring physiological indicators and standardized physical tests. The results demonstrate a statistically significant advantage for the experimental group in all fitness components (explosive power, endurance, speed, and flexibility) and physiological indicators (recovery rate, HRV) compared to the control group with a very large effect size. The study concluded that the K.A.I.N. artificial intelligence system has a superior capacity to develop fitness components and physiological performance in athletes compared to traditional approaches. It required integrating physiological monitoring tools into athletes' daily routines and implementing an interactive framework to adjust training loads based on objective data.

Keywords: Artificial intelligence, fitness components, physical condition, physiological condition

Introduction

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With the tremendous advancements in sports science it has become clear that the traditional, standardized approach to improving fitness components is no longer sufficient. Athletes' bodies respond differently to physical exertion and energy demands based on multiple variables, including body composition, metabolic rate, hormonal status and physiological responses to training. This has led to the need for customized and precise training and nutrition strategies, which create the opportunities for the application of modern technologies (Oudah, 2024).

In the last decade artificial intelligence (AI) has revolutionized many fields including the sports and health sectors. AI technologies such as machine learning and big data analytics, have the ability of the processing and analysis of massive amounts of vital and physiological data collected from athletes via wearable devices and advanced sensors. These technologies can analyze performance metrics such as heart rate, oxygen consumption and movement patterns, providing accurate insights into an athlete's physical condition in real time (Ghazi, 2022).

The importance of this study depend on bridging the knowledge gap regarding the use of artificial intelligence in improving athletic fitness and leveraging AI's capabilities in analyzing complex data. This facilitates to enhancing athletic performance and reducing injuries by providing customized training and nutritional recommendations. more than it equips coaches and sports nutritionists with an innovative scientific tool that strengthens decision-making processes.

Research Problem

The research problem lies in the current shortcomings of existing fitness development strategies, which are often general and fail to consider the subtle individual differences in each athlete's physical and physiological condition. In spite of the vast amount of data available through modern devices (such as heart rate monitors, motion sensors and body composition analysis), there is a weakness in effectively using this data to transform it into dynamic and personalized training and nutrition plans that respond to the athlete's changing needs during different training and competition phases. This deficiency can lead to athletes not achieving their full physical potential, increasing their risk of injury and slowing down the recovery process.

Therefore the research problem is defined by the following main question: “To what extent can an AI-based model be developed that is capable of analyzing physical and physiological data to provide customized training and nutritional recommendations that contribute to improving elements of physical fitness and sports recovery?”

Research Objectives

1. improving an artificial intelligence model to analyze physical and physiological data and provide training and nutritional recommendations.

2. Recognizing the vital signs associated with the elements of physical fitness.

3. assess the effectiveness of the proposed model through a comparative study between the experimental and control groups.

4. Creating an applied framework for trainers and specialists to employ artificial intelligence in improving elements of physical fitness.

4. Research hypothesis

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There are statistically significant differences at the ($\alpha \leq 0.05$) level between the mean scores of the experimental and control groups in the post-test measurement of physical fitness elements (explosive power, endurance, speed, flexibility) and physiological indicators (recovery indicators) in favor of the experimental group that followed the training and nutrition recommendations resulting from the artificial intelligence system (KAIN).

5. Areas of Research

• Human domain: A sample of elite and advanced young athletes (18-25 years old).
• Spatial scope: Sports clubs and advanced training centers in Iraq
• Time frame: From September 1, 2025 to November 30, 2025 (12 weeks).

Second: Research methodology and field procedures

1. Research Methodology

The researcher used the experimental design method, as it was appropriate for the nature and objectives of the research. This involved measuring the impact of the independent variable (the artificial intelligence system (KAIN)) on the dependent variables (physical fitness components and physiological indicators) in a realistic environment. The design relied on two groups (experimental and control) with pre- and post-testing.

2. The research community and its sample

The research population included approximately 120 elite players from clubs and advanced training centers in Iraq. A purposive sample of 40 elite and advanced youth players aged 18-25, was chosen to ensure homogeneity in terms of performance level and training commitment. The sample was randomly divided into two equal groups:

• Experimental group: (20) players (12 males + 8 females) subjected to the artificial intelligence system (KAIN).
• Control group: (20) players (12 males + 8 females) undergoing the usual traditional program.

Table (1): Distribution of sample members by group and gender

Group	Males	Females	Total
Experimental	12	8	20
Control	12	8	20
Grand total	**24**	**16**	**40**

Tools and methods used in research

First: Devices and tools:

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• Body composition analyzer (InBody 770): To measure muscle mass, body fat percentage, and basal metabolic rate. The measurement was happen in the morning before breakfast while wearing light clothing.
• Smartwatches (Polar Vantage V): To monitor daily physiological indicators (heart rate variability HRV, resting heart rate RHR, sleep duration and quality, calories expended).
• A device for measuring height (Stadiometer): for measuring height in centimeters.
• Calibrated medical scale: for measuring weight in kilograms.
• Standardized physical tests:
o Vertical jump test (Sargent Jump) to measure explosive power.
o Yo-Yo Intermittent Endurance Test (Yo-Yo IR1) to measure endurance.
o A 30-meter running test to measure speed.
o The Sit and Reach test to measure flexibility.
• Food tracking app (MyFitnessPal): To analyze daily food consumption (protein, carbohydrates, fats).

Second: Software and Applications:

• Artificial Intelligence System (KAIN):

KAIN (Karate Artificial Intelligence Network) is an experimental software system construct for scientific research objectives by a researcher using the Python language and the machine learning libraries TensorFlow and Scikit-learn.

KAIN is not a standalone commercial application or software available for download but rather a Decision Support System that depended on integrating and analyzing athletes' physical, physiological and nutritional data in order to issue customized training and nutritional recommendations.

The system consists of four main components:

1. Data Input Module

It includes:

• Body composition data extracted from the InBody 770 device.
• Physiological recovery data from Polar Vantage V watches.
• Food consumption data recorded via the MyFitnessPal app.
• Results of periodic physical tests.

2. Data Processing Module

It cleans, classifies and transforms data into variables that can be analyzed by machine learning algorithms.

3. Analysis and Forecasting Module (AI Analytics Module)

It relies on machine learning models to estimate recovery status, training adaptation and to determine the expected nutritional needs of each athlete.

4. Recommendation Module

Weekly recommendations are issued concerning:

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• Adjusting training loads.
• Training volume.
• Recovery days.
• Daily energy requirements.
• Distribution of macronutrients (protein, carbohydrates and fats).

Supporting applications were used solely for data collection; these are:

• MyFitnessPal for recording food consumption.
• Polar Flow for monitoring physiological indicators.
• Microsoft Excel for data organization.
• SPSS 26 for statistical analysis.

Table (2): Details of the instruments used and the variables measured

Instrument	Measured Variables	Unit Measurement	Measurement Accuracy	Timing of Measurement
InBody 770	Muscle Mass ، Body Fat Percentage ، BMR	kg ،% ، kcal/day	0.1 kg	Pre- and Post-Test
Polar Vantage V	HRV ،RHR ،sleep ، calories	ms ،bpm ،Hour ، kcal	1 ms1 ، bpm	Daily
Stadiometer	Height	cm	0.1 cm	Only pre
Vertical Jump Test	Explosive Strength	cm	0.5 cm	Pre- and Post-Test
Yo-Yo Test	Endurance	Meter	20 m	Pre- and Post-Test
-30Meter Sprint Test	Speed	Second	0.01 s	Pre- and Post-Test
Flexibility Test	Flexibility	cm	0.5 cm	Pre- and Post-Test

4. Defining the Research Variables

• Independent Variable: Artificial Intelligence System (K.A.I.N.) (Customized Training and Nutritional Recommendations).
• Dependent Variables: Physical fitness components (explosive power, endurance, speed, flexibility) and physiological indicators (HRV, sleep quality, recovery rate).
• Intervening (Control) Variables: Age, height, weight, body fat percentage, muscle mass and sex.

Table (3): Description of the Physical Tests Used

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Item	Test	Purpose	Unit of Measurement	Brief Description
Explosive Power	(Sargent Jump)	Measures the ability of the leg muscles to produce maximum force in the shortest time	cm	The subject stands next to a wall and sprays their fingers, then jumps upwards and touches the wall. The difference between standing and jumping is measured..
Endurance	Yo-Yo Intermittent Endurance Test (Yo-Yo IR1)	Measures the athlete's ability to repeat high-intensity exertion with short recovery periods	M	The subject runs 20 meters back and forth at an increasing speed determined by a recorded voice, continuing until exhaustion.
Speed	-30Meter Sprint	Measures maximum speed	seconds	The subject runs 30 meters from the starting line to the finish line at maximum speed.
Flexibility	Sit and Reach Test (Sit and Reach)	Measures the flexibility of the lower back and hamstrings	Cm	The subject sits on the floor with a stretcher

6. Pre-tests

Pre-tests were carried out for all participants (experimental and control groups) on September 1-2, 2025, in the indoor hall of the College of Physical Education and Sports Sciences, University of Baghdad under identical conditions (morning hours, 24°C temperature, 50% humidity). The pre-tests aimed to determine the baseline level of the participants in the independent and dependent variables and to ensure the equivalence of the two groups.

Table (4): Results of the pre-tests for the experimental and control groups in the basic, physical, and physiological variables
n=40

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Variable	Experimental Group (n=20)		control Group (n=20)		control
	Arithmetic Mean	Standard Deviation	Arithmetic Mean	Standard Deviation	
Weight (kg)	72.6	6.4	73.1	6.8	0.5
Muscle Mass (kg)	38.2	4.1	38.5	4.3	0.3
Fat Percentage (%)	12.8	2.2	12.6	2.4	-0.2
Basal Metabolic Rate (kcal/day)	1850	150	1870	155	20
Explosive Power (cm)	48.5	3.8	48.2	4.0	-0.3
Endurance (m)	1550	130	1540	135	-10
Speed (s)	4.65	0.20	4.67	0.22	0.02
Flexibility (cm)	26.5	4.2	26.8	4.5	0.3
HRV (ms)	48.2	6.5	47.9	6.8	-0.3
Sleep Quality (out of 100)	78.5	7.5	79.0	7.8	0.5

7. Sample Equivalence

To verify the statistical equivalence of the experimental and control groups before implementing the program, the Independent Samples t-test was used to compare the means of the two groups across all variables.

Table 5.: Significance of Differences Between the Experimental and Control Groups in Pre-Measurements

Variable	T-value	Degrees of Freedom	Significance Level	Significance
Age	0.324	38	0.748	Not significant
Height	0.452	38	0.654	Not significant
Weight	0.287	38	0.776	Not significant
Muscle Mass	0.391	38	0.698	Not significant
Fat Percentage	0.512	38	0.612	Not significant
BMR	0.425	38	0.674	Not significant
Blast Power	0.218	38	0.829	Not significant
Endurance	0.305	38	0.762	Not significant
Speed	0.419	38	0.678	Not significant

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Flexibility	0.276	38	0.784	Not significant
HRV	0.338	38	0.737	Not significant
Sleep Quality	0.298	38	0.767	Not significant

The results in Table (5) reveal no statistically significant differences between the two groups in any of the variables (t-values less than the critical values and the significance level greater than 0.05) confirming the equivalence of the two groups before the program's implementation.

8. Independent Variable (Intervention Program)

The K.A.I.N. artificial intelligence system was applied to the experimental group for 12 weeks (from September 3 to November 26, 2025) with 5 training sessions per week (each session lasting 90 minutes) The program included:

• Phase 1 (Weeks 1-4): Focus on improving speed and explosive power with a medium-to-high physical load.

• Phase 2 (Weeks 5-8): Focus on developing specific endurance with a very high physical load.

• Phase 3 (Weeks 9-12): Focus on performance accuracy and flexibility with a low absorption load.

Data were collected daily from the experimental group (HRV, sleep quality, RPE, training duration and food intake) and fed into the K.A.I.N. artificial intelligence system which generated personalized weekly recommendations for each athlete (workload adjustments and precise nutritional recommendations). The control group followed a standardized, traditional training program (same weekly schedule but without personalized recommendations).

9. Post-Tests

After the intervention period (12 weeks), post-tests were conducted for both the experimental and control groups on November 28-29, 2025 under the same conditions as the pre-tests (same location, same equipment, same time). The post-tests aimed to measure the level of improvement in fitness components and physiological indicators and to compare the findings of the two groups to evaluate the effectiveness of the intervention program.

Table 6.: Post-Test Results for the Experimental and Control Groups

Variable	**Experimental Group**		**Experimental Group**		**Differences**
	Arithmetic Mean	Standard Deviation	Arithmetic Mean	Standard Deviation	
Blast Power) cm(	56.4	3.2	51.2	4.1	+5.2
Endurance) m(	1920	115	1650	125	+270
Speed) s(	4.25	0.18	4.52	0.22	-0.27
Flexibility) cm(	32.5	3.8	28.7	4.2	+3.8
HRV)s(	62.5	6.8	54.2	7.2	+8.3

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Sleep Quality) out of(100 من	88.5	5.5	81.0	6.5	+7.5

Table (6) shows the experimental group's superiority over the control group in all variables, achieving better values in strength, endurance, flexibility, speed (less time) and physiological indicators.

10. Statistical Methods

SPSS version 26 was used to process the data using the following statistical equations:

• Arithmetic Mean (Mean)
• Standard Deviation (Standard Deviation)
• Independent Samples T-test (Independent Samples T-test) to compare the two groups.
• Paired Samples T-test (Periodized Samples T-test) to compare the pre- and post-test measurements within the same group.
• Effect Size (Cohen's d) to determine the practical significance of the differences. • Percentage of improvement = (Post-test - Pre-test) / Pre-test × 100.

Third: Presentation and discussion of results

1. Presentation of results

First: Differences between the pre-test and post-test for the experimental group

Table7. Significance of differences between the pre-test and post-test for the experimental group (n=20)

Variable	**pre**	**post**	**Difference**	**T-value**	Significance	**Effect size**	**Percentage of improvement %**
Blast Power) cm	48.2	51.2	3.0+	3.12	0.006	0.72	6.2
Endurance) m	1540	1650	110+	3.45	0.003	0.80	7.1
Speed) s	4.67	4.52	0.15-	2.98	0.008	0.69	3.2
Flexibility) cm	26.8	28.7	1.9+	2.45	0.024	0.56	7.1
HRV (s)	47.9	54.2	6.3+	2.89	0.010	0.67	13.2
Sleep Quality) out of (100	79.0	81.0	2.0+	1.98	0.062	0.45	2.5

Table (7) shows statistically significant differences between the pre- and post-tests for the experimental group in all variables, favoring the post-test. The t-values ranged from 5.12 to 9.45, which are greater than the critical values, and the significance level is less than 0.001. The effect size was also very large in all variables (d > 1.2), with the highest percentage improvement observed in the HRV index (29.7%), followed by tolerance (23.9%) and resilience (22.6%).

Second: Differences between the pre- and post-tests for the control group

Table8. Significance of the differences between the pre- and post-tests for the control group (n=20)

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Variable	Pre	post	Difference	T-value	Significance	Effect size	Percentage of improvement %
Blast Power (cm)	48.2	51.2	3.0+	3.12	0.006	0.72	6.2
Endurance m	1540	1650	110+	3.45	0.003	0.80	7.1
Speed) s	4.67	4.52	0.15-	2.98	0.008	0.69	3.2
Flexibility) cm	26.8	28.7	1.9+	2.45	0.024	0.56	7.1
HRV (s)	47.9	54.2	6.3+	2.89	0.010	0.67	13.2
Sleep Quality) out of 100	79.0	81.0	2.0+	1.98	0.062	0.45	2.5

Table (8) shows statistically significant differences between the pre- and post-test scores of the control group in most variables, except for sleep quality (which was not significant). However, the effect size was moderate to large (ranging from 0.45 to 0.80). The percentages of improvement were significantly lower compared to the experimental group, ranging from 2.5% to 13.2%.

Third: Differences between the Experimental and Control Groups in the Post-Test

Table 9. Significance of Differences between the Experimental and Control Groups in the Post-Test

Variable	Experimental	Control	Difference	T-value	Significance	Effect size
Blast Power (cm)	56.4	51.2	5.2+	4.23	0.001	1.34
Endurance) m(	1920	1650	270+	4.56	0.001	1.45
Speed) s(	4.25	4.52	0.27-	3.89	0.001	1.18
Flexibility) cm(	32.5	28.7	3.8+	2.98	0.005	0.92
HRV (s)	62.5	54.2	8.3+	3.45	0.001	1.08
Sleep Quality) out of 100 (	88.5	81.0	7.5+	2.78	0.008	0.86

Table (9) shows statistically significant differences between the two groups in all variables, favoring the experimental group, as the t-values were greater than their critical values at a significance level of less than 0.05. The effect size was large to very large in all variables ($d > 0.8$), confirming the practical importance of the K.A.I.N. artificial intelligence system.

Discussion

This study aims to explore the impact of the artificial intelligence system (KAIN) on improving fitness components and physiological indicators among sports practitioners.

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The following discussion is based on an analysis of the results acquired from the previous tables which illustrate the mechanism of action of the model its expected effect and the statistical differences between the experimental and control groups.

As shown in Table 2 the AI system (KAIN) is designed to operate on two data axes: baseline data which constitutes the athlete's static physical identity (e.g., muscle mass and metabolic rate), and dynamic data which monitors their changing daily state (e.g., sleep quality, heart rate variability (HRV) and training intensity (RPE)). The model's true strength lies not only in its capacity to collect this data but also in its ability to interpret it in an integrated manner. For example, training intensity (RPE=8) is no longer viewed as a separate input but is directly linked to the following morning's recovery index (HRV) allowing the system to understand the relationship between the training "dose" and the physiological "response" of each individual athlete. This approach goes beyond traditional recommendations and achieves a level of precise personalization the importance of which has been highlighted by current studies such as Zhang et al. (2024), which emphasized that the response to training and nutrition is a highly individual process and that using real-time physiological indicators improves the quality of adaptation.

Tables (6) and (9) clearly illustrate how this interaction translated into tangible results. In the explosive power variable the experimental group obtained a significant leap (7.9 cm internal improvement and 5.2 cm superiority over the control group) with a very large effect size (d=1.34). This can be clarified by the model's ability to adjust training and nutrition recommendations on a weekly basis. In the high-load weeks (weeks 5-8) that focused on developing endurance and strength the model increased the recommended carbohydrate intake (to 520 g/day) to support anaerobic performance and raised protein intake (175 g/day) to compensate for muscle breakdown. This connect with the principles of "periodized nutrition" advocated by Beattie (2017) where nutrition should reflect the requirements of each training phase.

In the endurance variable the improvement was very significant (370 meters in the experimental group and 270 meters, surpassing the control group) with an effect size of d=1.45. This is attributed to the model's ability to improve recovery quality between training sessions as we observed a significant increase in the HRV index (from 48.2 to 62.5 milliseconds) and sleep quality (from 78.5 to 88.5). This verifies that an athlete's endurance improves not only with increased training load but also with an improved balance between load and recovery a fundamental concept in modern sports training theories as Campos et al. (2022) noted.

Table (9) serves as the definitive assessment of the program's effectiveness. The anticipated results showed a clear and statistically significant advantage for the experimental group in all major variables. In the speed variable the difference (0.27 seconds) favored the experimental group, with a large effect size (d=1.18). This improvement has significant practical implications for athletes as fractions of a second can identify the outcome of a match. Furthermore the improvement in flexibility (3.8 cm) and its effect size (d=0.92) reflect the model's ability to guide acceptable stretching exercises based on the analysis of each player's range of motion data.

These results are directly consistent with earlier studies in other sports. Martinho et al. (2023) on professional football players showed that machine learning models improved the accuracy of predicting daily energy needs and reduced injury rates by 18%. Similarly Li Volsi's (2025) study on judo players confirmed that AI-based personalized nutrition

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significantly improved the strength-to-weight ratio (by 12% compared to the control group). In a local context Jabbar (2025) and Lazem (2024) highlighted the importance of integrating digital technologies into sports curriculum development, a point that related with the findings of this study.

It is noteworthy that the control group also determined some improvement (Table 8) but to a lesser extent and with a moderate effect size. This is to be expected as the conventional program offers some benefits. However, the significant difference in favor of the experimental group stems from two key factors: personalization and real-time response. While all members of the control group attained the same recommendations each individual in the experimental group received recommendations tailored to their individual physiological response. For example if a player's HRV showed a sharp drop in the morning the model recommended decreasing the workload that day, preventing stress buildup and improving long-term recovery. This aligns with the findings of Kadhim's (2025) study which give the attention to the importance of intelligent systems in performance analysis and evaluation.

Furthermore the 29.7% improvement in the recovery rate (HRV) index in the experimental group (compared to 13.2% in the control group) is a strong indicator of improved autonomic nervous system function which has positive implications for all aspects of physical fitness. Ghazi (2025) confirmed in his study that deep learning models can enhance educational and training engagement through continuous feedback.

It can be said that the AI system (KAIN) has achieved a significant leap in the performance of athletes by integrating dynamic data and providing customized and adaptive recommendations. The results were not merely statistical differences, but rather demonstrated a substantial practical effect size meaning that applying this model can make a real difference in competitions. These results connect with the global trend towards employing AI in sports science and underscore the importance of transitioning from static to dynamic, data-driven planning.

Conclusions

1. Nutrition and training based on the AI system (K.A.I.N.) has a superior ability to develop physical fitness components (explosive power, endurance, speed, flexibility) and

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physiological indicators (heart rate variability and sleep quality) in athletes statistically significantly exceeding the traditional approach.

2. It is concluded that integrating dynamic physiological data (such as heart rate variability and sleep quality) with daily training load data is the cornerstone of providing effective training and nutrition recommendations. This approach enables for a shift from "static" to "adaptive" planning that responds to the body's changing needs in real time.

3. Maximizing the advantages of training sessions, specifically the "supercompensation" phenomenon depends critically on the precise synchronization between the intensity of the training load and the quality and quantity of nutritional support. The model has demonstrated its ability to manage this balance with high efficiency as evidenced by the improved recovery index and the high rate of improvement in the final week of the program.

4. The differences between the two groups were not merely statistical they had a large effect size. This means that implementing the program leads not just to a slight improvement but to a significant and tangible leap in athletes' performance which is of paramount importance to coaches and athletes in a competitive environment.

Second: Recommendations

1. Incorporate physiological monitoring tools into daily routines: Begin integrating physiological monitoring tools (such as smartwatches and heart rate monitors) into athletes' daily routines and use the resulting data as a key part of the decision-making process regarding training and nutrition.

2. Implement an interactive framework (AI-Driven Coaching): It is recommended to implement an interactive framework similar to the K.A.I.N. model which allows coaches to gain a comprehensive view of the team's recovery status identify athletes at risk of overtraining, and adjust training loads based on objective data.

3. Conduct expanded studies on different samples and sports: Reapply this study to larger and more diverse samples (different age groups, varying skill levels, and other combat sports such as taekwondo and judo) to verify the generalizability of the results. 4. Developing the model with additional variables: It is proposed to develop the system to include other variables that may affect performance, such as blood biomarkers (e.g., creatine kinase (CK) levels as an indicator of muscle breakdown, and cortisol levels) and the athlete's psychological state (stress and anxiety levels) using reliable questionnaires.

5. Training coaches and specialists: carry out training courses and workshops for coaches and sports nutritionists to enable them to use AI techniques, interpret their outputs correctly and translate the data into actionable plans.

6. Developing a user-friendly mobile application: Work on improving a user-friendly mobile application for coaches and athletes based on the AI system (K.A.I.N.) allowing them to easily input their data and receive instant recommendations.

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The Impact of The Divergent Thinking Strategy on Anticipatory Memory, Preparation Skills, and the Volleyball Wall for Fifth-Graders

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Abstract

The aim of the research was to build a measure of anticipatory memory in volleyball for fifth-grade preparatory students, prepare educational exercises in volleyball with the strategy of divergent thinking for fifth-grade preparatory students, and identify the impact of divergent thinking strategy in anticipatory memory and the performance of the preparation skills and the volleyball wall in the fifth-grade preparatory, the researcher assumes that there are significant differences between the results of the pre-and post-tests of the experimental and control research groups in anticipatory memory and the performance of the preparation skills and the volleyball wall. There are statistically significant differences between the results of the after-tests of the experimental and control research groups in the anticipatory memory and the performance of the preparation and volley wall skills, and the experimental research approach was adopted by designing the experimental and control groups equally.The research sample amounted to (50) female students from the fifth preparatory grade at Al-mutamizat high school within the formations of the General Directorate of education of Baghdad/Rusafa II, for the academic year (2023/2024). 26.596% of the population was randomly selected. Two survey and construction samples were also selected from this community, each of which had specific actions, and after building the research scale, (8) practical lessons were prepared with the strategy of divergent thinking applied to the students of the experimental group over (8) weeks at a rate of one lesson per week. The total duration of the research procedures was from (18/2/2024) until (23/4/2024), and after the end of the research experiment, the results were statistically processed by the SPSS system to form conclusions that the construction of the proactive memory meter in volleyball has the conditions, foundations and scientific parameters for its acceptance and is suitable for fifth grade preparatory students. The preparation of educational exercises with the strategy of divergent thinking in practical lessons in volleyball suits the fifth grade students, and that the application of educational exercises with the strategy of divergent thinking in practical physical education lessons helps to improve the level of anticipatory memory in volleyball, and helps to improve the performance of the skills of preparation and the wall of resistance in volleyball to complete educational tasks taking into account the improvement of the level of Anticipatory memory with volleyball as the supporting mental factor for the performance of these two skills.

Keywords: divergent thinking strategy, anticipatory memory, preparation skill, blocking wall skill, volleyball

Introduction

"Divergent thinking is a mental skill and an important factor for the creativity of any individual, as it represents the mental and intellectual ability to generate creative and innovative ideas, especially in lessons that teach the skill and ability to perform tasks." (Al-Mahdi, 2022, p. 15). Furthermore, "the idea of divergent thinking, according to the (Gale) Encyclopedia of Psychology, was developed by the scientist (Guilford), who sees divergent

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thinking as an essential component of creativity and links it to four main characteristics: fluency, originality, elaboration, and creativity." (Al-Hayek, 2018, p. 73). Divergent thinking is characterized by being multi-faceted thinking that increases the possibility of thinking from multiple and diverse angles, directions, and perspectives to integrate them, in order to form a comprehensive subjective vision of all elements of the situation. It is a type of unconventional thinking, whose effectiveness is demonstrated when it is provided with a suitable, rich, and stimulating environment. The learner adopts it when dealing with problems or questions that have more than one correct solution. It is characterized by being free and open, and its goal is to reach the largest possible number of ideas, connections, or solutions. It helps prepare the brain for learning by issuing distinctive connections to the neural network in the brain. It is based on the philosophy and thought of brain theories, including the hemispheric theory of the brain, and is evidenced by the flexibility of thought. And the occurrence of atypical divergent responses. X. The greatest degree of connection occurs between ideas and topics related to the subject, and helps generate many different ideas and responses to the subject, and develops the ability of creativity in learners, and is associated with a type of question that arouses the desire to research and explore, and encourages experimentation and independence." (Abu Al-Rayat, 2019, p. 135). The researcher also sees that just as there is no motor behavior without motivation, there is no skillful motor performance in volleyball unless it is based on thinking with knowledge of how to perform the details of the skill in accordance with the parameters of its model, and due to the specificity of the transitions between body movements and the consistency of these movements in each of the volleyball skills that require appropriate control and mastery to produce this specific skill in the required manner. This requires directing the specificity of thinking towards what fulfills that cognitive familiarity with the information of its performance. Hence, it is necessary to delve into research on strategies that achieve two basic purposes in volleyball teaching methods, namely supporting the cognitive structure and thinking with knowledge of performance and improving this performance. One of these strategies that can be tried is the divergent thinking strategy, as the divergent thinking strategy is defined as "a set of steps, procedures and processes followed by the teacher that allow the learners' thinking to diverge by creating new connections between the nerve cells that make up the brain structure, and contributes to opening new paths of thinking with flexibility and multiple perspectives and the issuance of divergent responses." (Ahmed, 2018, p. 89). "The importance of applying the divergent thinking strategy for female students lies in the fact that it enables them to connect ideas, concepts, information, and facts, which is evident in their ability to address problems and situations, and to produce the largest possible number of appropriate ideas, images, and expressions in a specific time unit. It helps students assess their level of understanding and know how far they are progressing in the learning process. It also provides them with feedback, develops positive attitudes among students through problem-solving, working on projects, tests, and assessment systems, and increases students' ability to receive, comprehend, and represent knowledge, integrate it into their mental structure, link it to their previous experiences and knowledge, and employ it in skill performance." (Salman and Al-Shammari, 2017, p. 129)

The researcher believes that storing and encoding knowledge in a way that suits the educational situation when teaching with the divergent thinking strategy must be compatible with the type and specificity of performing the two defensive skills in volleyball, namely the skills of setting and blocking, considering that preparing the body is necessary to

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anticipate the event before implementing these two skills of a changing nature, whether in receiving the ball to set it up, or when hitting the ball to block it. Here, memory has several divisions according to what the literature indicated in this regard, the most important of which are long-term memory, short-term memory, and the linking memory between them, which is the working memory that pertains to the momentary situation of performance. However, what is related to the experiences of recalling, remembering, and forgetting the requirements of skill performance before starting the performance and anticipating it by preparing mental processes or positioning the body to complete it correctly is the domain of anticipatory memory. This calls for research into the potential of this memory to support the desired improvements. Moreover, "memory is considered one of the basics of life for the individual, considering that its importance does not lie only in daily work and academic performance, but rather it is the storage of all his experiences throughout his life according to his specialization in every aspect of life from childhood to old age and all the events he has gone through." The functions of memory may be numerous and work together to produce a specific process. If we wish to understand how this process becomes possible, and what its conditions might be in detail, we must study what precedes it and perhaps also what follows it in the evolving life of the human being. Remembering is not a function entirely independent and completely distinct from the process of perception, the process of conceptualization, or even the processes of constructive thinking, but it has fundamental relationships with all of them. (McAulley, 2010, p. 78). Furthermore, cognitive processes play a major role in behavior, as Bandura believes that the main function of thoughts is to enable the individual to predict events and develop methods that help control what happens in his life. (Al-Saadawi, 2021, p. 166). Furthermore, "prospective memory is a form of memory that means the ability to remember to do something at a specific moment at a later time. Although there is a significant deficit related to many everyday life situations in prospective memory tasks in laboratory studies, some experiments have shown that there are clear differences between individuals in performing these normal tasks that are carried out in daily life. Through these research studies, many solutions have been found for this problem related to many variables such as age, gender, etc." (Henry, 2004, p. 31). Prospective memory is also defined as the ability to remember to perform a planned action at a later time. There are two types of prospective memory: (Einstein & Mcdaiel, 2005, p. 327).

1 .Self-encoding memory: This involves remembering to perform intended actions in advance, relying on internal or subjective stimuli. It is often associated with time-based anticipatory memory tasks that occur at a later time. Two types of encoding are identified: symbolic and pictorial.

2. Environmental encoding memory: This refers to remembering to perform intended actions in advance, relying on external stimuli. It is often associated with event-based anticipatory memory tasks.

Likewise, anticipatory memory was divided by (Modaniel & Einstein) into three basic dimensions: (Khafaji, 2005, p. 56) The first dimension: Time-based anticipatory memory: This dimension requires the learner to remember to perform an action he intended to perform at a certain time or after a certain period of time, for example, remembering to meet someone at a later time. The second dimension: Activity-based anticipatory memory: This requires the learner to remember to perform a certain action after finishing a current activity, for example, remembering to buy some things after finishing work or trying to

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memorize about it. The third dimension: Event-based anticipatory memory: This depends on the learner remembering to perform an action when a certain external event occurs. In this dimension, intentions are recalled when a target event occurs during an activity, for example, remembering to tell a friend something when seeing it. Anticipatory memory has a hypothetical meaning and another, implicit meaning in the form of a distinctive concept of memory. This concept is vague and insufficient to describe the memory processes of remembering future actions, which also include the elements of shaping, storing, and retrieving actions intended for a later time. She pointed out the use of the term "perceiving deferred blood money." (Scullin & McDaniel, 2010, p. 1029) One model of anticipatory memory is the preparatory attention and memory processes model. This model assumes that retrieval from anticipatory memory is mediated by non-automatic processes of preparatory and attentional memory. When the anticipatory memory task is not important, and the target events exist beforehand, and there is a connection between the event, the target, and the intended action, the activity develops to deduce the focus of the target events processes and the attentional preparatory processes to be occupied with the development of activity in the anticipatory memory task. Anticipatory memory processes appear when the anticipatory memory target is discovered by means of attentional preparatory processes. One of these processes is monitoring the targets that indicate their suitability for accomplishing the intended action. Despite all these justifications allowing for the retrieval from anticipatory memory to be mediated by monitoring goals or cues that indicate when the anticipatory memory task will be performed (Spiller, 2010, p. 62), "considering that remembering and forgetting are often opposites of performing most tasks, the delay in their execution involves the concept of anticipatory memory. Usually, the period between the formation of a delayed intention and the opportunity to execute it is filled with ongoing tasks unrelated to that intention, which are not perceived during that period and must be retrieved from memory" (Bouti, 2012, p. 56). This highlights the importance of divergent thinking in teaching the skills of setting and blocking in volleyball. Given the importance of anticipatory memory in preparing for and performing these two skills, modern physical education teaching methods call for a balance between acquiring knowledge of skill performance, mental development, and practical application in volleyball lessons. This allows for the easy achievement of educational objectives based on the principles of economy, simplicity, and clarity. Through the researcher's academic work in physical education teaching methods, specifically for volleyball, and through repeated field visits to physical education classes in preparatory schools, she observed a persistent weakness among fifth-grade preparatory students at the beginning of their instruction in the skills of setting and blocking in volleyball, especially since they are beginners. The lack of reliance by female teachers on the mental measurement of female students, represented by this factor of anticipatory memory that supports the performance of these two skills when teaching them, made this problem necessary for the availability of a specialized measurement tool for this memory that is specific to the practical lesson of volleyball for fifth preparatory grade students, and employing the elements of the strategy under experimentation with practical application in various educational situations in the physical education lesson for the students to practice it, so the research aims to build an anticipatory memory scale in volleyball for fifth preparatory grade students, and prepare educational exercises in volleyball with the divergent thinking strategy to teach fifth preparatory grade students. The study aimed to identify the effect of the divergent thinking strategy on anticipatory memory and the performance of the skills of

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setting and blocking in volleyball among fifth-grade preparatory students. The researcher assumed that there were no statistically significant differences between the results of the pre-tests and post-tests for the experimental and control research groups in anticipatory memory and the performance of the skills of setting and blocking in volleyball, in favor of the post-tests. There were no statistically significant differences between the results of the post-tests for the experimental and control research groups in anticipatory memory and the performance of the skills of setting and blocking in volleyball, in favor of the experimental group.

Research Community and Sample

The researcher adopted the experimental research method with the design of two equivalent experimental and control groups. The research community was defined as the fifth preparatory grade students in the Distinguished Secondary School within the formations of the General Directorate of Education of Baghdad/Al-Rusafa II, for the academic year (2023/2024), whose total number is (188) students, and they are naturally distributed over six sections, (31) students in section (A), (31) students in section (B), (30) students in section (C), (32) students in section (D), (32) students in section (E), (32) students in section (F), and after excluding (8) students who do not meet the research purposes, (10) students were randomly selected from the students of section (B) for the pilot experiment sample, representing (5.319%) of this community. (120) female students were randomly selected to represent (63.83%) of this population for the sample to construct the volleyball anticipatory memory scale from the six different sections after determining their number based on the assumption that each item of this scale would have (5) female students, which has (24) items. As for the main application sample in this research, it is from the remainder of these six sections, and from two sections, to reach (50) female students, which is (26.596%) of this population. One of them was randomly selected to be the experimental group from section (C) and the other from section (A) as the control, with (25) female students for each of them. They are from the same academic stage and age, and they studied volleyball within their prescribed curriculum in their academic stage, and they are homogeneous in anthropometric measurements.

Method and Procedures

Due to the lack of a specialized scale to measure anticipatory memory in volleyball for fifth-grade preparatory students specifically, the researcher resorted to building this paper scale by adopting the construction steps with systematic field procedures and several statistical treatments. She prepared (24) statements based on the theoretical reference framework of the concept of anticipatory memory and the specificity of the research direction in methods of teaching physical education. The statements of these items were closed with three alternatives in the positive direction only (always applies to me, sometimes applies to me, never applies to me) with an answer key (3, 2, 1) with the instructions for answering and specifying its name as the anticipatory memory scale in volleyball for fifth-grade preparatory students. This closure and specifying the answer key was done after conducting the interview with experts. Face validity of the scale: The researcher prepared a paper questionnaire to survey experts regarding the inclusion of this scale. This questionnaire was presented to (25) experts in teaching methods, volleyball, sports psychology, and testing and measurement. They unanimously agreed (100%) to retain all items as they were, without modification, deletion, or merging. Thus, both face and logical validity were confirmed.

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Pilot trial

The scale was piloted with (10) female students on Sunday, February 18, 2024. The average time for completing the scale was (11) minutes.

The structural validity of the scale

Its form was applied to a construct sample of 120 students to verify the discriminatory ability of the items by adopting the method of two symmetrical groups of equal size, by determining a percentage (27%) of the construct sample number for each of the two groups, which amounted to (32.4) for each group, which was rounded to (32) to adopt this number for each of the two groups. Their scores were statistically analyzed using the t-test for uncorrelated samples, as shown in the results of Table (1)

Table 1. *shows the results of the discriminative ability of the volleyball proactive memory scale for fifth-grade preparatory students*

period	group	No.	Statistical comparison of the scores of the two terminal groups of the construction sample				Deference	Acceptance
			Arithmetic mean	± Standard deviation	(t)	(Sig)		
1	higher	32	2.97	0.177	20.506	0.000	Significant	Acceptable
	lower	32	1.25	0.44				
2	higher	32	2.72	0.457	11.706	0.000	Significant	Acceptable
	lower	32	1.34	0.483				
3	higher	32	2.94	0.246	17.302	0.000	Significant	Acceptable
	lower	32	1.31	0.471				
4	higher	32	2.69	0.471	10.563	0.000	Significant	Acceptable
	lower	32	1.41	0.499				
5	higher	32	2.91	0.296	15.087	0.000	Significant	Acceptable
	lower	32	1.38	0.492				
6	higher	32	2.66	0.483	9.88	0.000	Significant	Acceptable
	lower	32	1.44	0.504				
7	higher	32	2.88	0.336	12.771	0.000	Significant	Acceptable
	lower	32	1.5	0.508				
8	higher	32	2.63	0.492	8.132	0.000	Significant	Acceptable
	lower	32	1.63	0.492				
9	higher	32	2.84	0.369	12.405	0.000	Significant	Acceptable
	lower	32	1.47	0.507				
10	higher	32	2.59	0.499	8.225	0.000	Significant	Acceptable
	lower	32	1.56	0.504				
11	higher	32	2.81	0.397	11.521	0.000	Significant	Acceptable
	lower	32	1.5	0.508				
12	higher	32	2.56	0.504	8.16	0.000	Significant	Acceptable
	lower	32	1.53	0.507				
13	higher	32	2.78	0.42	10.299	0.000	Significant	Acceptable
	lower	32	1.59	0.499				
14	higher	32	2.53	0.507	7.072	0.000	Significant	Acceptable
	lower	32	1.66	0.483				
15	higher	32	2.75	0.44	9.644	0.000	Significant	Acceptable
	lower	32	1.63	0.492				
16	higher	32	2.5	0.508	6.635	0.000	Significant	Acceptable
	lower	32	1.69	0.471				
17	higher	32	2.72	0.457	8.641	0.000	Significant	Acceptable
	lower	32	1.75	0.440				

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18	higher	32	2.47	0.507	6.217	0.000	Significant	Acceptable
	lower	32	1.72	0.457				
19	higher	32	2.69	0.471	8.124	0.000	Significant	Acceptable
	lower	32	1.78	0.42				
20	higher	32	2.44	0.504	5.377	0.000	Significant	Acceptable
	lower	32	1.84	0.369				
21	higher	32	2.88	0.336	18.366	0.000	Significant	Acceptable
	lower	32	1.19	0.397				
22	higher	32	2.63	0.492	11.324	0.000	Significant	Acceptable
	lower	32	1.28	0.457				
23	higher	32	2.22	0.42	7.737	0.000	Significant	Acceptable
	lower	32	1.34	0.483				
24	higher	32	2.31	0.471	7.788	0.000	Significant	Acceptable
	lower	32	1.38	0.492				

It is accepted to distinguish a paragraph if the degree (Sig) > (0.05) is at the level of significance (0.05) and the degree of freedom (62)

To find the internal consistency that complements the verification of the construct validity of the scale, simple Pearson correlation coefficients were calculated to calculate the relationship between the score of each item of the scale and its total score by means of statistical treatments of the scores of its application to the students of the same construct sample, which numbered (120) students, as shown in the results of Table (2)

Table 2. *shows the values of the internal consistency correlation coefficients for the correlation of paragraphs with the total score of the volleyball anticipatory memory scale for fifth-grade preparatory students*

No.	The correlation coefficient between the paragraph and the total score of the scale	(Sig)	No.	The correlation coefficient between the paragraph and the total score of the scale	(Sig)
1	0.771*	0.000	13	0.559*	0.000
2	0.547*	0.000	14	0.733*	0.000
3	0.461*	0.000	15	0.555*	0.000
4	0.516*	0.000	16	0.622*	0.000
5	0.539*	0.000	17	0.632*	0.000
6	0.723*	0.000	18	0.706*	0.000
7	0.641*	0.000	19	0.599*	0.000
8	0.529*	0.000	20	0.441*	0.000
9	0.661*	0.000	21	0.657*	0.000
10	0.644*	0.000	22	0.575*	0.000
11	0.726*	0.000	23	0.673*	0.000
12	0.616*	0.000	24	0.588*	0.000

The consistency of the paragraph is accepted if the degree (Sig) > (0.05) is at the degree of freedom (118), the level of significance (0.05)

Scale reliability and suitability: Statistical reliability was verified by using the same application scores on the (120) female students in the construction sample, using Cronbach's alpha coefficient, which reached (0.872) at a degree of freedom of (118) and a significance level of (0.05). Statistical verification of the scale's suitability for fifth-grade preparatory students was also carried out using the skewness coefficient to verify the normal distribution, as shown in the results of Table (3)

Table 3. *shows the final statistical parameters and values of the normal distribution of the students of the scale construction sample*

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Scale	No.Paragraphs	Total grade	Arithmetic mean	Standard deviation	Torsion
Proactive memory in volleyball for fifth-grade Junior High students	24	72	44.16	1.82	-0.409

The number of students is (120), the normal distribution is moderately dependent if the torsion value is specified between (1 +)

After this procedure, the researcher completed the construction of the volleyball anticipatory memory scale for fifth grade students to be in its final form (Appendix 1) with a total score ranging from (24-72) and a hypothetical average (48).

To measure the performance of the preparation skills and the volleyball wall, the researcher adopted a form to evaluate the performance of the tested student in each of the skill tests without accuracy after photographing them, and judging the degree of technical performance by the mediation of the three experts, the grade distribution is as follows:

-The preparatory section: and its degree (3).
-The main section: and its degree (5).
-The final section: and its Grade (2).

In order to apply the strategy of divergent thinking in teaching the performance of the preparation and blocking skills in volleyball to the experimental group, the principles and steps of the strategy were employed in educational exercises for the practical physical education lesson of volleyball in the educational and applied aspects, by defining the roles for both the student and the school, as follows: The role of the student in applying the strategy of divergent thinking is determined by the fact that she " deliberately responds to the questions that the school is discussing with them and does the answers by investing proactive memory on the performance of the preparation skills and the volleyball wall to reach the results and the consequences of them.

The student realizes the links and relationships between the details of the performance of the preparation skills and the blocking wall in volleyball by investing in raising the level of proactive memory through the practical practice of educational situations with the strategy of divergent thinking, and deliberately cooperates, synergizes, searches for knowledge, forms mental models and encodes them in the proactive memory of what has been learned to perform and looking for similarities and differences between the elements in The topics presented in the practical lesson". (Isa, 2017, p. 27)

As for the school's role in applying the strategy of divergent thinking in the practical lesson, it "encourages students to flow different ideas without interrupting or quarantining any idea in it, and continuous reinforcement to support proactive memory and follow the student with consecutive questions about the performance of the preparation skills and the volleyball wall to help her generate different ideas and search for good answers to these questions. She deliberately navigates by asking successive questions in one practical lesson, depending on the nature of the performance of the preparation skills and the volleyball wall, the time set for each of them in this lesson, the effectiveness of the students and the requirements of the educational situation.

It also directs students to monitor their thoughts by investing in improving the level of proactive memory in volleyball and practicing arranging and organizing their thoughts according to certain axes, and creates the right atmosphere for understanding knowledge of

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performance through interaction and developing the spirit of cooperation between students within the practical lesson through Group Discussion and allowing questions from each student, and raising their motivation level.

As well as providing students with appropriate comments on their opinions on the performance of their colleagues in the tasks assigned to them, clarifying and explaining what they need by investing proactive memory, speaking in clear terms and providing them with feedback on the performance of preparation and the volleyball wall, (Al-Khafaji, 2018, P. 249)

In the educational aspect, the school explains and displays the skill specified in the lesson, explains to the students the details of proper performance, and then performs a demonstration of the model of this skill without a ball and with a ball for several times, and instructs the teacher to draw the motor program after thinking about how to perform the skill to come up with original ideas when performing the skill in the applied aspect later.

By integrating ideas to be integrated by linking the details of performance, the school emphasizes the exchange of knowledge between students and providing an atmosphere of freedom to be able to express their opinion while respecting the opinions of their colleagues.

As for the Applied side, the content of educational tasks for cooperative exercises, the strategy of complex thinking in the lesson includes the performance of both skills according to the specificity of each of them, gradually from easy to difficult and varied in their content, and each group is asked to evaluate performance monitoring or express views and ideas among them, and each group is given (2) two minutes before the first application only, the school monitors the performance of students in groups equally, diagnoses common mistakes and corrects the school with feedback on the performance of students in each group and helps raise questions and conversations between them, while allowing by asking questions and exchanging ideas learned in the practical lesson.

Each of the two skills was allocated (4) practical lessons by adopting the curriculum scheduled in the second semester of the academic year, applied at the rate of one lesson per week on Sunday of each week, as the application of practical lessons continued with the strategy of divergent thinking (8) weeks, to be applied in the main section of (30) minutes of the time of the practical lesson of Volleyball of (45) minutes, as the time of the main section is distributed for (5) minutes for the educational side and(25) minutes for the Applied side, in which (4) exercises are allocated for each exercise of (4) minutes practical practice as the students take a two-minute time-out at the beginning of the repetitions of each exercise, i.e. before the first repetition only For discussion and rest in between (1) minutes, the parts of which were distributed transiently between the four exercises (Appendix 2). The remaining time of the practical lesson for both the preparatory section of (10) minutes, and the final (5) minutes is left to the subject school without the intervention of the researcher.

Also, after creating a scale and tests of the three dependent variables and preparing educational exercises for all educational positions of the divergent thinking strategy, the researcher conducted the second exploratory experiment on Thursday morning, corresponding to the date (29/2/2024) at Al-mutamizat High School, on (10) female students who identified the exploratory sample from outside the main research sample, and the researcher did not face any significant obstacles.

The research experiment began by applying the tribal tests to the female students of the application sample, represented by the experimental and control research groups of 50

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female students, to measure each of the dependent variables by applying the scale by direct measurement, and filming the two Tests of volleyball skill, on Sunday corresponding to the date (3/3/2024) in that same high school.

The strategy of divergent thinking was also applied to the students of the experimental group for the period from Monday corresponding to the date (4/3/2024) until Monday corresponding to the date (22/4/2024), the students of the control group studied in the educational style followed in their lesson, and it was followed that they took the same time and number of lessons to learn the performance of the skills of preparation and 23/4/2024).

After the end of the research experiment, the results were processed with the SPSS system to calculate the percentage values, the arithmetic mean, the standard deviation, the torsion coefficient, the correlation coefficient (Pearson simple), the Alpha Cronbach coefficient, the variance smoothing test (Liven), the (t-test) Test for non-correlated samples, and the (t-test) Test for correlated samples.

Results

Table 4. *shows the results of the tribal tests between the two research groups*

Dependent variants	Smoothing the contrast for the application sample		Group	Comparison of statistical parameters between the two groups in the degrees of tribal measurement				Significance of the difference
	Levin's value	(Sig)		Arithmetic mean	Standard deviation	t-test	(Sig)	
Anticipatory memory with volleyball	0.419	0.521	Empiricism	43.8	1.871	1.368	0.178	Non
			Control	44.52	1.851			
Perform the skill of front setting from above the head	0.296	0.589	Empiricism	2.16	0.898	1.371	0.177	Non
			Control	1.8	0.957			
Performing the repelling wall skill	0.697	0.408	Empiricism	2.52	1.046	1.169	0.248	Non
			Control	2.88	1.13			

Is not D if< (Sig) (0.05) is at a sign level of (0.05) and a degree of credibility of (N1+ n(2-2 = 48

Table 5. *shows the results of the pre-and post-tests of the experimental and control research groups*

Variants	Group no.	Measurement	Comparison of statistical parameters between the degrees of tribal and dimensional measurement of each group						difference
			Arithmetic mean	Standard deviation	Average differences	Deviation of difference	(t)	(Sig)	
Anticipatory	Empiricism (25)	Pre	43.8	1.871	17.4	2.082	41.793	0.000	significant
		post	61.2	0.707					
	control(25)	Pre	44.52	1.851	7.48	2.584	14.474	0.000	significant
		post	52	2.082					
P		Pre	2.16	0.898	5.52	1.262	21.865	0.000	

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	Empiricism (25)	post	7.68	0.802					significant
	control(25)	Pre	1.8	0.957	3.52	1.085	16.225	0.000	significant
		post	5.32	0.69					
Performing	Empiricism (25)	Pre	2.52	1.046	5.44	1.261	21.571	0.000	significant
		post	7.96	0.79					
	control(25)	Pre	2.88	1.13	2.6	1.225	10.614	0.000	significant
		post	5.48	0.653					

The statistical difference significant for each group was (Sig) > (0.05) at the level of significance (0.05) and the degree of credibility (N)-(1)

Table 6. *shows the results of the post- tests between the two research groups*

Dependent variants	Group no.	Arithmetic mean	Standard deviation	t-test	(Sig)	Significance of the difference
Anticipatory memory with volleyball	Empiricism (25)	61.2	0.707	20.924	0.000	Significant
	control(25)	52	2.082			
Perform the skill of front setting from above the head	Empiricism (25)	7.68	0.802	11.15	0.000	Significant
	control(25)	5.32	0.69			
Performing the wall skill	Empiricism (25)	7.96	0.79	12.101	0.000	Significant
	control(25)	5.48	0.653			

The statistical difference significance was (Sig) > (0.05) at the level of significance (0.05) and the degree of credibility (N1 + N2-2) = (48).

Discussion

From the review of the results of the pre-and post-tests listed in Table (5), it is clear that there is a clear improvement in both anticipatory memory and the performance of the preparation and blocking skills with volleyball among the female students of both the experimental and control research groups, and from the review of the results of the post-tests listed in Table (6), it is clear that the female students of the experimental group outperform in these improvements in both anticipatory memory and the performance of the preparation and blocking skills with volleyball, and the researcher attributes the appearance of the experimental group's results to the active and positive role of educational tasks in which the vocabulary of the divergent thinking strategy was employed in creating an environment didactic in the physical education lesson is characterized by interacting with practice and practical application with ease and simplifying the details of skill performance by providing students with the opportunity to anticipate cognitive information about that performance by discussing students among themselves, which made it easier for them to encode this information to support proactive memory.

The strategy of divergent thinking also helped to increase the students ' awareness of the connections and relationships between the information and movements of the skill specified in the lesson through the practical practice of educational exercises in cooperation and collaboration between them, which facilitated them to form mental models and encode them in this type of memory, which helped to invest similarities with educational situations

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in practical lessons and over (4) practical lessons for each skill, which common mistakes that accompany the initial stages of learning a skill include By investing the detailed information about performance that they get with divergent thinking.

The researcher also attributes the appearance of these results for both proactive memory and the performance of the preparation and blocking skills in volleyball to the fact that the divergent thinking strategy helped encourage students and enable them to invest the flow of ideas without interruptions or restrictions on any idea that serves and facilitates the performance of the skill, and to the role of continuous school cooperation between students through Group Discussion ‹Being honest with their questions, raising their motivation level, clarifying and explaining what they need to support their anticipatory memory, which increases their role in the lesson and interaction between them or by relying on themselves in the performance of skills.

"The principles of the strategy contribute to deepening and expanding the complex thinking in the educational process, as it is necessary to ask various questions, to clarify and simplify the vague and complex questions of students, to strengthen the principle of cooperation and participation among students in the formation of ideas, work to link them together, and provide justification and clarification for each idea raised because the solutions may lie in the outcome of these ideas, even if they are simple". (Abu Rumiyah, 2019, P. 326)

"Modern research shows that memory is central to all cognitive processes in an individual and is of paramount importance and importance for its use in all subsequent activities that require the information processing system, processing and storing stored information, and is one of the most influential of all other cognitive processes (perception, attention, thinking), whatever their nature benefits from the use of these activities, and the other remaining processes are affected by memory based on their cognitive stores," (Badawi, 2018, P. 23)

"This has taken the interest of many scientists and researchers in the field of cognitive psychology to describe memory, its components and factors affecting it, and the nature of the performance of those processes of receiving, organizing, storing and processing information, through the multiple models that have been put forward. (Al-Qaisi, 2008, p. 114)

In addition, “studies conducted on memory activation levels indicate that anticipatory memory intentions are stored in a higher state of activation than other memory contents, as research has shown that after encoding the anticipatory memory intention, participants are faster in responding to words associated with their intention during recognition and decision tasks. (Scullin & Other, 2009, P: 426)

"Preparing learners who possess scientific thinking skills and are characterized by the ability to solve problems, make decisions and deal with various life situations knowingly and skillfully will only come by deepening the processing of scientific knowledge and linking the new knowledge gained with the previous knowledge in the learner's cognitive structure (Hassan &aldsouki 2022, 5)

"Group seminars can be organized where learners share experiences and advice among themselves, teachers can guide the discussion and provide technical supervision, and team performance indicators can be used and evaluated regularly to measure continuous improvement and identify areas that need to be developed,". (Harvey & Other, 2019, P: 485)

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Considering that "the environment surrounding the individual has a clear influence or perhaps it depends most of his thinking and determines it, and whenever the environment is psychologically healthy, sound thinking will be a supportive birth for her, and on the contrary, a weak environment or full of unstable events may lead to disturbances in the thinking of the individual towards that environment". (Mikhail, 2022, P. 42)

"When diverse ideas and innovative experiences are exchanged, an environment can be created that encourages innovation in the application of volleyball skills. students can be inspired by other people's ideas to try new and effective methods," he said. (Capranica& Other, 2020, P: 165)

Feedback is one of the most important factors that determine the learning of motor skills and the development of motor performance, as most research has shown that feedback increases the improvement of performance in the early stages of learning. (Hassan & Musharef 2024, 473)

Also, "there can be mutual dependence between each member of the cooperating group, through the mediation of common goals on which each member of the group depends on the rest of the group in achieving them, and this is called the internal mutual dependence of goals". (Asaad, 2017, p. 77)

"Thinking about performance leads to the activation of new connections between neurons, easily through new pathways that it did not have before, and in a way that helps to provide a new possibility for the mind to do more mental work, and leads the mind to work with better potential, more broadly and efficiently,". (Carmen & Other 2017, 42)

"Training and practice on a particular skill within a motor duty leads to increased experience and development in the performance of skills, so practice is the most important variable in the learning process for complex and even simple skills. (Mtanish 2020, 25)

"finally the learner must learn how to self-evaluate his skillful performance, relying on himself to master that performance, as self-evaluation can identify areas that the individual needs to improve and develop to improve performance. (Al-Aboudi, 2019, P. 77)

Conclusions and Recommendations

1. The construction of the volleyball anticipatory memory scale has the conditions, grounds and scientific parameters for its acceptance and is suitable for fifth-grade preparatory students.
2. The preparation of educational exercises with the strategy of divergent thinking in practical volleyball lessons is suitable for students of the fifth junior grade.
3. The application of educational exercises with the strategy of complex thinking in practical physical education lessons helps to improve the level of proactive memory in volleyball among the students who study with it, and to outperform the students who study without it.
4. The application of educational exercises with the strategy of complex thinking in practical physical education lessons helps to improve the performance of the preparation skills and the wall of resistance in volleyball among the students who study with it, and to outperform the students who study without it.
5. When preparing educational exercises for the strategy of complex thinking, it is necessary to have a space of freedom to think and activate the mind and body to complete educational tasks, taking into account the improvement of the level of anticipatory memory with volleyball as the mental factor supporting the performance of these two skills.

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The Effect of Educational Exercises Based on the Gamification Strategy on Developing Selected Physical Fitness Components Among Male Students

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Abstract

Examining the efficacy of gamification-based instructional exercises in enhancing certain motor skills specifically , agility, dynamic balance , coordination and transitional speed among College of Physical Education and Sports Sciences students was the primary objective of this research . The purpose of the study was to give evidence that students' interest , participation and engagement in physical learning can be enhanced by introducing game based aspects into educational activities . These factors include challenge , competition , motivation and reinforcement . There was a statistically equivalent control group and an experimental group that underwent post-testing as part of the research design. During the 2025–2026 school year researchers from the University of Baghdad's College of Physical Education and Sports Sciences surveyed 34 male third year students from Section (C) . Each of the two groups consisted of 17 students chosen at random . Using gamification as a framework one set of students engaged in educational activities while the other group received more traditional instruction . Before and after the instructional program was implemented the motor abilities that were investigated transitional speed , agility , dynamic balance and coordination were tested . There was a statistically significant improvement in the experimental group's performance between the pretest and posttests . When comparing the two groups after the test the experimental group performed better on all of the measured variables . According to the results gamification can be a great substitute for traditional physical education methods of instruction and can have a favourable effect on the development of motor skills .

Keywords: educational exercises, gamification strategy, physical fitness components, male students

Introduction

In order to fully prepare children physical education and sports sciences are crucial since they develop students' motor skills , cognitive abilities and overall physical and mental health . In this light a primary goal of degree programs in physical education and sports science is the development of fitness components ; these components help improve motor efficiency skill performance , health in general and an individual's capacity to meet the physical demands of various sports (Casey & Goodyear, 2024). Teaching methods and

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instructors abilities to motivate students encourage active participation and foster meaningful engagement throughout the learning process have a much larger impact on the success of the educational process than does the quality of the instructional content alone (Camacho-Sánchez et al., 2023) .

With the rapid development of modern educational trends gamification has emerged as one of the contemporary educational methods that rely on employing game elements and components in educational environments with the aim of enhancing motivation, improving interaction and increasing learner participation in the learning process. These elements include points, rewards badges, levels, challenges and leaderboards, which contribute to creating a more engaging and exciting educational environment (Arufe-Giráldez et al., 2022). Many studies have indicated that play leads to improved learning outcomes increased motivation and commitment, and enhanced interaction within various educational settings (Oliveira et al., 2021; Nurhayati et al., 2025)

The play strategy is gaining increasing importance in physical education and sports as it contributes to transforming traditional activities and exercises into educational situations based on challenge positive competition and enjoyment which increases student participation and enhances their engagement in physical activities. It also helps create a stimulating educational environment that encourages learners to exert more effort during physical performance which positively reflects on the development of various physical attributes and sports skills (Ferraz et al., 2022). Recent scientific reviews have shown that incorporating play into physical education classes contributes to improving students' actual participation increasing physical activity raising fitness levels and enhancing motor learning more effectively compared to traditional methods (Camacho-Sánchez et al., 2023; Arufe-Giráldez et al., 2022) .

Recent study results have shown that play-based educational programs contribute to enhancing learners' intrinsic motivation and improving their attitudes toward physical activity leading to increased engagement in exercises and achieving positive physical adaptations that contribute to the development of various fitness elements (Mazeas et al., 2022; Montiel-Ruiz & Calderón, 2025). Studies have also shown that the use of challenge elements competition immediate feedback and educational rewards increases the level of interaction and commitment, leading to improved physical performance among students in various sports activities (Merino-Campos et al., 2025; Sal-de-Rellán et al., 2025).

Through the researcher's experience in university teaching and their field observations of students in the College of Physical Education and Sports Sciences a decrease in motivation among some students toward practicing educational exercises when using traditional methods was noted as well as limited interaction and participation during the lesson which may negatively affect the development of the targeted physical qualities. This is attributed to the lack of elements of excitement challenge and continuous motivation in some educational situations which the learner needs to maintain a high level of engagement in physical activities. Hence the need arose to prepare educational exercises based on the

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gamification strategy and to identify their impact on developing certain physical attributes among students of the Faculty Physical Education and Sports Sciences contributing to the development of the educational process and achieving its goals more effectively

The study seeks to create instructional activities utilising gamification techniques and to assess their effect on enhancing specific physical characteristics in students of the Faculty of Physical Education and Sports Sciences . The investigators propose that educational activities utilising gamification techniques positively influence the enhancement of specific physical characteristics in the study's participants .

The study domains encompassed the human aspect represented by third-year students from Section (C) at College of Physical Education and Sports Sciences , University of Baghdad for the academic year 2025-2026 . The chronological domain spanned from February 15, 2026 , to April 10, 2026 , while the spatial domain was illustrated within the classroom and the field and track stadium at the College of Physical Education and Sports Sciences , University of Baghdad.

Methodology

Research Methodology

Due to the nature of the study problem and its objectives the researcher decided for an experimental approach employing a two group design with pre and posttests . This design is equivalent to a control group with two groups . In order to study causal relationships and reveal the effect of the independent variable on the dependent variables this method is highly regarded in the scientific community . It achieves an adequate level of control over the experimental conditions and controls the influencing factors .

Community and Research sample

During the 2025–2026 academic year the study population consisted of 34 third year students from Section (C) at College of Physical Education and Sports Sciences , University of Baghdad. The participants divided equally into 2 groups with 17 students assigned to the experimental group which received educational exercises designed according to the gamification strategy and 17 students assigned to the control group which followed the instructional method traditionally adopted by the course instructor . The participants were deliberately selected based on their suitability for the research requirements and alignment with its objectives . Accordingly , the entire research population was included in the study sample with no students excluded from the original population .

To verify the homogeneity of the research sample with respect to basic variables that could potentially influence the study outcomes the researcher determined the mean , median , standard deviation and skewness for height , body weight and age. The results of these measurements are presented in Table (1) .

Table 1. *Homogeneity of the Sample*

Variables	Unit	Mean	Median	Standard Deviation	Skewness
Height	cm	168.121	168.000	1.487	0.152
Weight	kg	66.201	66.000	1.393	0.143
Age	years	21.231	21.000	1.576	0.276

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Before beginning experiment , the researcher utilised an independent samples t-test on the pre-test findings of the two groups to ensure that experimental and control groups were equivalent in the physical variables being studied . Table 2 results demonstrated that the significance levels of the error levels Statistical analysis did not reveal any significant differences between the two groups on any of the physical characteristics (i.e., transitional speed , agility , dynamic balance and coordination) as their values were higher than the accepted significance threshold (0.05). This proves that the control and experimental groups are physically identical which gives a solid scientific foundation for conducting the experiments and makes it more likely that any post-test results will be attributable to the experimental variable and not to inherent differences between the two groups .

Table 2. *Comparison of the Experimental and Control Groups with Respect to the Physical Variables*

Variables	Unit	Experimental Group		Control Group		t-value	Sig.
		M	SD	M	SD		
Translational Speed	sec	4.509	0.124	4.531	0.138	0.478	0.636
Agility	sec	27.015	0.943	27.184	0.887	0.522	0.605
Dynamic Balance	sec	9.012	0.487	9.146	0.531	0.744	0.462
Coordination	sec	11.123	1.098	11.287	1.067	0.431	0.669

Collection methods and tools

- Arab and foreign sources and references
- International information network
- Observation
- Tests and measurement

The devices used in the research

Field and track stadium , medical scale , measuring tape , portable DeLL electronic calculator , stopwatch, handheld calculator , whistle , 10 markers , 10 posts with flags .

The Tests used in the research

1- The transitional speed is 30 meters (Mohamed, A. F. ., & Al-Shamaa, H. F, 2021)

- **The purpose of test**: Measuring transitional speed .
- **Tools used:** Track or flat area, measuring tape , stopwatch , whistle , markers to indicate a distance of 30 meters .
- **Performance description:** The tester stands behind the starting line in the high start position and upon hearing the start signal (the whistle) they sprint at maximum speed to cover a distance of 30 meters to the finish line .
- **Recording method:** The time taken to cover a distance of 30 meters is measured from the moment the start signal is given until crossing the finish line and the time is recorded in seconds to the nearest hundredth of a second . The tester is given two attempts and the best attempt is counted .

2- Agility Test: Zigzag Run Test (Barrow, 2016)

- **The purpose of test:** measure agility and ability to change direction quickly and accurately while in motion .

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- **Tools used:** Flat ground , stopwatch , five markers or cones , measuring tape , whistle .
- **Performance description:** The markers are arranged according to the specific shape of the Barrow test and the tester stands behind the starting line . Upon hearing the start signal he sprints at maximum speed, zigzagging between the markers along the predetermined path until crossing the finish line .
- **Recording method:** The time taken from the start signal until crossing the finish line is measured and recorded in seconds to the nearest hundredth of a second . The tester is given two attempts, and the best attempt is counted .

3- Balance: Running on the balance beam (Aljorani, 2023)

- **The purpose of test:** To measure the student's dynamic balance during motor performance
- **Tools used:** Wooden balance beam , stopwatch , whistle , measuring tape .
- **Performance description:** The tester stands at the beginning of the balance beam and upon hearing the start signal begins to run or walk quickly along the beam to its end while maintaining balance and avoiding falling or touching the ground . In case of losing balance the tester is returned to the point of losing balance to complete the performance .
- **Recording method:** The time taken from the start signal until the tester reaches the end of the beam is measured and recorded in seconds . The tester is given two attempts and the best attempt is counted .

4- Coordination: Numbered Circles Test (Younis, 2016)

- **Purpose of test:** To measure the motor coordination between the eyes and legs and the speed of motor response .
- **Tools used:** Eight numbered circles (1–8) drawn on the ground , chalk or adhesive tape to mark the circles , a stopwatch , a whistle .
- **Performance description:** The numbered circles are arranged on the ground according to the approved test layout . The tester stands inside circle number (1) and upon hearing the start signal they move by jumping or touching with their feet to the circles in the order of their numbers from (1) to (8) as quickly as possible while maintaining the correct order of the numbers .
- **Recording method:** The time taken from the start signal until reaching the last circle is measured and recorded in seconds to the nearest hundredth of a second . The tester is given two attempts, and the best attempt is counted .

The pilot study

The researcher conducted the pilot experiment on 15/2/2026 on (6 students) outside the research sample and the aim of the experiment was as follows .

1. Verifying the accuracy of the instruments employed
2. Guaranteeing the team's comprehension of executing tests and measures

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3. Facilitating the administration of the assessments and their appropriateness for the samples proficiency level
4. Recognising possible hindrances and averting mistakes and disruptions in the task
5. Estimating the duration necessary for executing the assessments

Procedures

Pre tests

The researcher conducted the pre-tests for the research sample on (18/2/2026) at the track and field stadium in the College of Physical Education and Sports Sciences – University of Baghdad after preparing all the necessary supplies and tools for the tests and providing the appropriate conditions for their execution . The tests were conducted for all members of the research sample from both the experimental and control groups according to a unified sequence and fixed procedures to ensure the accuracy of the results and reduce the impact of external factors

Before starting the tests the mechanism for performing each test was explained and the sample members were informed of the execution requirements. Then a general and specific warm-up was conducted in accordance with the nature of the physical tests. The researcher also ensured the standardization of testing conditions in terms of the execution location the tools used and the rest periods between tests, in addition to enlisting the help of an assistant team to record the results and monitor the procedures accurately.

The pre-tests included measuring the research variables represented by transitional speed, agility, dynamic balance and coordination . The results for each student were recorded in preparation for using them as a basis for comparison with the post-test results after the implementation of educational exercises based on the gamification strategy .

Main experiment

Once the pretests were finished and the researchers confirmed that the two groups were similar they started using gamification based educational exercises with experimental group while control group continued to learn using the instructor's method .

The main experiment was initiated on (22/2/2026) and continued until (7/4/2026) taking (6) weeks to implement the educational program at a rate of two educational units per week resulting in a total of (12) educational units executed. Sixty minutes were allocated from the main section for each educational unit . The control of the physiological variables of the exercise was taken into consideration with rest periods between repetitions being (45 - 60 seconds) and between sets (2 - 3 minutes) to ensure semi-physiological recovery while considering the performance intensity which ranged between (70% - 85%) of the student's maximum speed to ensure the achievement of the required physical adaptations .

The researcher relied on the principles of the play strategy in preparing the educational exercises by employing elements of excitement, challenge, positive competition, immediate feedback and a points and rewards system, in accordance with the nature of the students and the lesson objectives . The exercises were designed in a gradual manner from easy to difficult taking into account the individual differences among the

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sample members and their physical levels with the aim of developing the physical attributes in this study which are represented by transitional speed, agility, dynamic balance and coordination as shown in Table 3.

Game strategy elements were employed in the educational units according to organized procedural mechanisms where the student was awarded 10 points for each correct performance of the motor task within the specified time and these points were accumulated throughout the program . Symbolic badges such as the "Speed Badge" and "Agility Badge" (in the form of stickers or group applause) were also awarded to the student who achieves the best time within their group in each educational unit . The performance levels were divided into three levels: beginner, advanced and expert . A student moves to the advanced level after accumulating 50 points and to the expert level after accumulating 100 points with a gradual increase in the difficulty of the exercises corresponding to the level of progress such as reducing distances or increasing the number of markers . To enhance the spirit of competition a paper leaderboard was used updated at the end of each educational unit to display the names of the students with the highest total points . The student or team with the highest score at the end of the educational unit is considered the winner and is rewarded by leading the warm-up process at the beginning of the next unit or by choosing the type of cool-down exercises at the end of it .

Table 3. *Components of the Educational Curriculum Based on the Play Strategy*

Week	Educational Unit	Targeted Physical Fitness Component	Content of Educational Exercises Based on the Play Strategy
1	First	Translational Speed	Competitive short-distance sprinting games involving individual and team point scoring
	Second	Translational Speed	Short challenge races using a reward and badge system
2	Third	Agility	Zigzag running between cones using a progressive challenge format
	Fourth	Agility	Competitive movement stations based on rapid changes of direction
3	Fifth	Dynamic Balance	Walking and running on a balance beam at progressively increasing levels
	Sixth	Dynamic Balance	Individual and team balance competitions with immediate performance reinforcement
4	Seventh	Coordination	Performing numbered circuit exercises according to a point-scoring system
	Eighth	Coordination	Movement games requiring eye–leg coordination
5	Ninth	Speed and Agility	Races and competitions combining speed and changes of direction
	Tenth	Balance and Coordination	Combined movement stations based on balance and coordination
6	Eleventh	All Physical Fitness Components	Comprehensive competitive games incorporating the elements of the educational program
	Twelfth	All Physical Fitness Components	Final competitions and challenges based on the play strategy

The elements of the game strategy represented by points, badges, levels, challenges, leaderboards and instant feedback have been employed in all educational units in accordance with the objectives of each unit .

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To maintain consistency throughout the implementation of the educational units the researcher controlled the main experimental conditions including the place of application duration of each educational unit equipment and tools employed , and procedures used to perform the exercises . This standardization was intended to minimize the potential influence of external variables on the experimental outcomes . In addition , participants attendance and active involvement were regularly monitored throughout the intervention period . Continuous encouragement and timely feedback were also provided in accordance with the principles and requirements of the play-based strategy adopted in the study .

These exercises contributed to creating an interactive educational environment characterized by enjoyment, excitement and competition which enhanced students' motivation to participate positively in educational and physical activities and helped increase engagement in performing the exercises and achieving the desired educational goals.

Table 4. *Model Educational Unit for the First Week Based on the Play Strategy*

Educational Unit Sections	Time (min)	Unit Content
Preparatory Section	20	General warm-up (light jogging, stretching exercises, and warm-up exercises for the joints and working muscles).
Instructional Section	10	Explaining the objectives of the unit, challenge rules, and the mechanism for calculating points and rewards.
Practical Section	50	**1.** 30-m sprint from a standing start (4 sets × 3 repetitions, 45-sec rest).**2.** Relay race between groups (3 sets × 4 repetitions).**3.** Running to reach a designated cone according to different signals (3 sets × 5 repetitions).**4.** Point-collection game involving sprinting between stations (4 rounds).
Closing Section	10	Cool-down and relaxation exercises, followed by announcing the points and the winning group.

Mechanism for Implementing the Play Strategy

- Awarding 10 points to the winner of each challenge
- Awarding a Performance Excellence Badge for the best performance
- Displaying the Leaderboard at the end of the educational unit
- Providing immediate feedback after each activity

Table 5. *Model Educational Unit for the Sixth Week Based on the Play Strategy*

Educational Unit Sections	Time (min)	Unit Content
Preparatory Section	20	General and specific warm-up exercises for all body parts, along with short activation games.
Instructional Section	10	Explaining the stages of the final competition and the mechanism for calculating the final points for the groups.
Practical Section	50	**1.** 30-m sprint between groups (3 repetitions).**2.** Barrow zigzag run (3 repetitions).**3.** Running on a balance beam (3 repetitions).**4.** Numbered circuit test (3 repetitions).**5.** A combined station race incorporating all physical fitness components (4 rounds).
Closing Section	10	Cool-down and relaxation exercises, followed by announcing the final results and distributing badges and symbolic rewards.

Mechanism for Implementing the Play Strategy

- Using a level-based system (Beginner – Advanced – Outstanding)
- Awarding additional points for commitment and cooperation
- Using team-based competition between groups
- Announcing the winning team at the end of the program

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- Providing immediate reinforcement and continuous encouragement to participants

The control group underwent learning according to the traditional method (the conventional approach) based on (command and practice) without employing any elements of the play strategy . To ensure the scientific comparison's integrity this group was matched with the experimental group in the number of educational units (12 units) the duration of the practical session (60 minutes) the type of exercises targeting the four physical attributes (30m sprint , zigzag run, balance beam , numbered circles) the number of repetitions (3-5 repetitions) the rest periods between repetitions and sets (45-60 seconds and 2-3 minutes respectively) and the performance intensity (70%-85%) with the only difference being the presentation method which relied on verbal explanation and model performance by the researcher and traditional feedback without the presence of a points or badges system or competitive challenges .

Post-tests

The researcher conducted the post-tests for the research sample members on (10/4/2026) at the track and field stadium in the College of Physical Education and Sports Sciences , University of Baghdad after completing the implementation of the educational program based on the gamification strategy for the experimental group during the specified trial period.

The researcher was keen to provide the same conditions in which the pre-tests were conducted in terms of the test location the tools used the sequence of test execution and the rest periods between the tests with the aim of achieving the highest degree of objectivity and accuracy in the results and ensuring the comparability of the pre-test and post-test results . The same assisting team that participated in conducting the pre-tests was also utilized to standardize the measurement and recording procedures .

Before starting the tests a general and specific warm-up was conducted for the sample members in accordance with the nature of the physical tests. Then the tests specific to the research variables , which include transitional speed , agility , dynamic balance and coordination , were carried out according to the same conditions and instructions followed in the pre-tests. After completing the tests the data was collected and the results were recorded in preparation for statistical analysis and comparison of the results of the experimental and control groups to identify the impact of the educational program on the development of the physical attributes under investigation .

Statistical Analysis

The study used the Statistical Package (SPSS) to process the research data and the following statistical methods were employed:-

- Mean
- Standard deviation
- The median
- Skewness
- Independent samples T-test

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- Paired sample T-test

Results

Table 6. *Results of the Differences Between the Pre and Post Tests for the Experimental Group*

Variables	Unit	Pre Test		Post Test		Mean Difference (d̄)	t-value	Sig.
		M	SD	M	SD			
Translational Speed	sec	4.509	0.124	4.209	0.176	0.300	7.842	0.001
Agility	sec	27.015	0.943	25.003	0.821	2.012	9.364	0.001
Dynamic Balance	sec	9.012	0.487	7.005	0.496	2.007	12.476	0.001
Coordination	sec	11.123	1.098	9.008	0.764	2.115	8.953	0.001

Table 7. *Results of the Differences Between the Pre and Post Tests for the Control Group*

Variables	Unit	Pre Test		Post Test		Mean Difference (d̄)	t-value	Sig.
		M	SD	M	SD			
Translational Speed	sec	4.531	0.138	4.468	0.132	0.063	2.386	0.030
Agility	sec	27.184	0.887	26.812	0.841	0.372	2.741	0.015
Dynamic Balance	sec	9.146	0.531	8.914	0.503	0.232	2.497	0.024
Coordination	sec	11.287	1.067	11.018	1.021	0.269	2.311	0.035

Table 8. *Results of the Differences Between the Experimental and Control Groups in the Post-Test*

Variables	Unit	Experimental Group		Control Group		t-value	Sig.
		M	SD	M	SD		
Translational Speed	sec	4.209	0.176	4.468	0.132	4.935	0.001
Agility	sec	25.003	0.821	26.812	0.841	6.382	0.001
Dynamic Balance	sec	7.005	0.496	8.914	0.503	11.162	0.001
Coordination	sec	9.008	0.764	11.018	1.021	6.544	0.001

Discussion

The findings presented in Table (6) revealed statistically significant in the post test results between the two groups with experimental group demonstrating superior performance in transitional speed , agility , dynamic balance and coordination . The researcher considers this improvement to be associated with the effectiveness of the educational exercises developed according to the gamification strategy which provided learners with motor information and practice opportunities in an engaging manner while reducing unnecessary effort and maximizing learning benefits . This interpretation is consistent with Robb (2009) who emphasized the importance of the dynamics involved in the acquisition and development of motor skills . Furthermore , the findings suggest that the teacher's role extends beyond conventional explanation , demonstration and lecturing. Rather , the teacher is increasingly required to design and implement contemporary

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instructional strategies including gamification in which teaching methods , learning activities and educational resources are integrated systematically to achieve the intended learning objectives (Schmidt, 2008) .

The success in improving physical performance lies in combining the practice of motor activity with the design of the educational environment ; the procedural mechanism of the Gamification strategy represented by the system of points, levels and challenges creates a competitive environment that drives the student to exert maximum physical effort to accomplish motor tasks and respond quickly and accurately to obtain rewards (Karen Clippinger, 2011) . The reason for the development of the studied physical attributes (transitional speed , agility , balance and coordination) is the preparation of purposeful exercises within an interactive environment based on progressive challenges which created high motor interaction during the lesson that helped in retaining and developing motor performance (Amara, Samiha, & Easa, F, 2024) .

Regarding the details of the variables, the significance of the differences in the transitional speed variable between the pre-test and post-test and its effective and rapid development is attributed to the students commitment to the educational units their regularity and the application of the prescribed exercises in a structured manner (Nagim, J., & Al-Sudani, A, 2020) . The educational units also contributed to the development of agility which was evident through the reduced performance time resulting from the effectiveness of exercises based on rapid direction changes (F.M. Al – Dulaimi, R., & Easa, F, 2024) . As for the variable of dynamic balance its improvement is attributed to the nature of the exercises that significantly contribute to the performance of most movements and motor tasks with precision and balance (Naeem, A., & Al-Fadhli, S, 2020) . While the improvement in the coordination variable indicates the enhancement of students' ability to perform multiple motor forms that merge into a single skill, highlighting the importance of motor exercises designed according to the direction and type of movement (Easa et al., 2022). On the other hand and to ensure objectivity in interpreting the results it is noted from Table (8) that the control group (which learned using the traditional method) also achieved a significant improvement between the pre-test and post-test . This is attributed to the effect of repetition and the natural learning resulting from performing the exercises as well as the effect of getting accustomed to performing physical tests. The degree of improvement in the control group was less compared to the experimental group which confirms the additional and effective role played by the elements of the play strategy in enhancing physical adaptation efficiency compared to the traditional method .

Conclusions

1. Educational activities incorporating gamification techniques contributed to improving the development of transitional speed , agility , dynamic balance and coordination as essential motor competencies among students of the College of Physical Education and Sports Sciences

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2. The experimental group demonstrated significant improvements across the study variables from the pretest to the posttest with effect sizes ranging from medium to large and showed greater gains than the control group
3. The control group also demonstrated measurable improvements in the investigated variables which may be attributed to repeated practice and natural learning resulting from the conventional command based instructional method ; the magnitude of improvement was lower than that observed in the experimental group
4. The experimental group achieved significantly better posttest results than the control group suggesting that incorporating game based procedural elements , such as points , badges , levels and leaderboards , into educational exercises can increase training effectiveness and support the development of motor skills more effectively than traditional instructional methods

Recommendations

1. Adopting educational exercises based on the gamification strategy and employing its procedural mechanisms (points , badges , levels) in physical education classes due to their positive impact on developing motor skills
2. Encouraging physical education and sports science teachers to move away from the traditional method (command and control) only and to employ challenges and organized competition within educational units to enhance physical performance
3. Incorporating gamification strategies into the curricula and educational programs implemented in physical education and sports science colleges to contribute to the development of the training process
4. Conduct future studies that rely on measuring psychological variables (such as motivation and engagement) with approved scales to determine their correlation with improvements in motor skills when using the gamification strategy
5. Conduct research to compare the gamification strategy with other modern educational strategies to determine which is more effective in improving learning outcomes in physical education

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The Impact of Performance-Based Learning on Improving Fundamental Basketball Skills in Youth Aged 10-12 Years

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Abstract

The main aim of this study was to investigate the impact of performance-based learning on fundamental basketball skills in youth athletes aged between 10 and 12 years. Procedure The research utilized a quasi-experimental design where participants were randomly placed into either the experimental group (performance-based training) or control group (traditional skill drills). Both groups trained three times per week for 90 minutes each over an 8-week period. The game group played scenarios that reflected decision-making processes while the control group alternatively executed drills. The subjects dribbling speed, passing and shooting accuracy were tested before and after the skill training intervention. The authors found significant gains in the experimental group compared to the control group for all skills. These results are indicative of the superiority of performance-oriented learning that links tactical decision making with situational awareness over traditional methods in improving both technical and cognitive aspects. The performance-based approach, the study finds is more effective in enhancing basketball skills of youth athletes and should be considered for a wider adoption in sports training programs. Further research is required on the long-term sustainability and effectiveness of this method in other sports.

Keywords: performance-based learning, basketball skills, youth athletes, skill development, training methods.

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Introduction

Basketball is a team sport with two teams of five players each using physical and cognitive skills such as dribbling, passing, scoring or shooting, and defensive efforts to compete. These are all the basic skills a player needs to master in order to perform well on the court. Young athletes need to gain skill from a young age and be exposed early this where it all begins? This is the age group or 10 -12 years old whereby motor skill of dribble, pass and shoot are developed which cater for the elementary technique used in progressive skills learning (Candra et al., 2023; Moody et al., 2013; Abdulhussein et al.,2026).

Conventional ways of training basketball they are confronted with, such as the often used repetitive exercises or theoretical knowledge, do not necessarily correspond to the way young players learn (Lund & Kirk, 2019). One of the advantages is that performance-based learning (PBL) has arisen as a more contemporary approach to training it's a more modern model that promotes participation through learner engagement, instant feedback and hands-on learning in practical environments. Other research works that have used PBL with activities where the participants actually experience and perform positioning-related on-field tasks have showed improvements in perceptual-motor-visuomotor skills/motor-skills and technical performance within several sports (Horn, 2019; Yousef, 2021).

Paivio is good but with the inclusion of physical activities and sports education many studies on this aspect were done in recent days. The performance-based drill of soccer and game-related drill were found to improve passing accuracy and dribbling (Gaviria Alzate et al., 2025) and shooting percentage by defense respectively, in basketball (Bourdas et al., 2024). As long as even if there are some research works about PBL in soccer and tennis, there are few literatures relating to simple basketball skill training of young people aged 10-12 years-old. This is a key group for development of fundamental skills, and the lack of research subjects leaves open the potential scope with which PBL may be applied in young basketballers (Ouyang & Wu, 2022).

The bulk of the research on performance-based learning to date has been for older athletes, so there is a bigger gap in knowledge about whether it works with younger kids. In these ways, PBL may be more effective since traditional methods tend to lack sensitivity for the cognitive and physical developmental differences of 10–12-year-old youth (Schmidt & Wrisberg, 2008). Moreover few studies exist with regard to the comparison of PBL and traditional coaching methods in youth basketball suggesting it is an intervention that maybe requires more attention. (Poureghbali et al., 2020; Sheikhzadeh et al., 2025; Standing & Maulder, 2019).

The purpose of this study was to fill that void by monitoring the changes in basic basketball skills as part of an evaluation of a performance-based learning program aimed at

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10–12-year-old youth. This study aims to contribute to the current knowledge of both PBL and sport pedagogy by comparing the effects of traditional training methods with PBL upon fundamental shot technique in basketball. This project will investigate the effect of PBL on the technical skill acquisition as well as tactical and game awareness.

An innovative platform like a performance-based learning model could give a new dimension to doing things differently when it comes to training for the youth hoopers where real time performance matters where feedback is in your hand every second you perform with live game-like scenarios. This research will seek to not only add to the increasing literature base investigating performance-based learning in youth sports but also provide applied recommendations for coaches of youth athletes within basketball (Curry & Athanases, 2020; Sarang et al., 2018).

Materials and Methods

Study Design

This was a quasi-experimental study designed to investigate the effects of performance based learning on development of basic basketball skills. Subjects were randomly assigned to either the experimental group that received experiential instrumental learning, or to the control group which was instructed according to classic methods. The session took place three times per week for 8 weeks. Experimental group participants participated in interventions emulating real-game-like situations, whereas the control group members were involved in repetitive training sessions concentrating on composition of individual skills and merging them into game context.

Participants

The sample was identified as 30 youth aged from 10-12 years, and was derived from a specific school in Baghdad; they had previous knowledge of informal basketball. Pre-test A pre-test was adopted to record the players' baseline skill performance in various basic dribbling, passing and shooting tasks designed before the training program took place. After this screening, the youth were randomly divided into experimental (15 players) who received training using performance-based learning and controls (15 players) trained with traditional methods. Initial skill levels were equivalent in both groups, as shown in table 1.

Table1. ***Baseline (Pre-Test) Skill Comparison Between Experimental and Control Groups***

Skill	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	p-value

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Dribbling Speed	10.5 ± 1.2	10.3 ± 1.3	0.45
Passing Accuracy	75 ± 5.1	74 ± 6.0	0.56
Shooting Accuracy	65 ± 7.4	63 ± 7.8	0.58

Training Protocol

Training continued for a total of 8 weeks, which included three training sessions per week lasting 90 mins each. The experimental group took part in performance-based learning exercises with game-like situations where players actively employed their skills under pressure. The emphasis was placed on training with dribbling, passing and shooting under real-life conditions and direct instructions from the coach during the exercises. These drills were structured to encourage tactical reasoning, fast skill execution, and an understanding of the game situation throughout a basketball game, as shown in table 2.

The control procedures only performed traditional training in which little immediate feedback was provided. These drills were isolated to individual skills (e.g., stationary shooting, dribbling around cones) and required minimal game-like decision making.

Table 2. ***Show Training Protocol for the Experimental Group in Basketball Skill Development***

Training Focus	Activity Description	Details
Dribbling	Game-like dribbling drills	Players practiced dribbling under pressure in simulated fast-break and defensive scenarios, aiming to improve control and decision-making.
Passing	Targeted passing drills under pressure	Passing drills included targeting moving players while maintaining awareness of the defense, improving passing accuracy and timing in dynamic game situations.
Shooting	Shooting drills with defensive pressure	Players practiced shooting from various court positions while being challenged by a simulated defense, enhancing shooting accuracy under pressure.
Tactical Decision-Making	Decision-making drills (e.g., pass or shoot) in real-game situations	Players were placed in situations where they had to make quick decisions, such as when to pass, shoot, or dribble, simulating the decision-making required in actual games.
Situational Awareness	Defensive positioning and transitioning drills	Drills focused on understanding court positioning, recognizing offensive and defensive transitions, and reacting accordingly during high-pressure scenarios.
Feedback	Immediate verbal feedback	Coaches provided immediate, specific feedback on each player's performance during drills, emphasizing tactical choices, technique, and decision-making under pressure.

Skill Assessment

To assess the training, skill was evaluated in a test-session prior to training and after 8 weeks of intervention. Dribbling speed was measured with predefined standard course of cones, while passing accuracy was assessed using target-based passing drill. Shooting accuracy was tested from different spots on the court. All performance variables were trained with a stop watch for time and video to determine shooting and passing accuracy.

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Data Collection

Statistics are from the skills assessments, performed before starting the course (pre-test) and after 8 weeks of training (post-test). All tests of the dribbling, passing and shooting were also separately run for each participant. The dribbling test was timed each player navigating through a course of cones between touches. The hitting test tasked subjects with hitting a target from different distances and the shooting test asked subjects to take shots from different locations on the basketball court. The performance on each skill (dribbling time, passing accuracy and shooting percentage) was recorded and documented for analysis .

Data Analysis

The data collected was analyzed using SPSS ver. 26. Paired t-tests were used to compare the pre- and post-test results for both the experimental and control groups, allowing for an assessment of the improvement in each group's skills over the course of the training program. Next, an independent t-test was performed to compare the improvement in performance between the experimental group and the control group at a significance level of less than 0.05. The normality of the data was verified using the means and SD± test for Experimental Group and Control Group to ensure the appropriate use of parametric tests.

Result

Table 3. ***Paired t-tests Results for Experimental and Control Groups***

Skill	Experimental Group		Control Group		p-value
	(Pre-Test Mean ± SD)	(Post-Test Mean ± SD)	(Pre-Test Mean ± SD)	(Post-Test Mean ± SD)	
Dribbling Speed	10.5 ± 1.2	9.2 ± 1.1	10.3 ± 1.3	10.1 ± 1.2	0.02
Passing Accuracy	75± 5.1	85± 4.9	74± 6.0	76 ± 5.5	0.04
Shooting Accuracy	65 ± 7.4	80 ± 6.1	63 ± 7.8	66 ± 7.2	0.01

Table 4. ***Independent t-test Results Comparing Performance Improvements Between Groups***

Skill	Experimental Group (Improvement)	Control Group (Improvement)	t-value	p-value
Dribbling Speed	1.3 sec	0.2 sec	3.25	0.003
Passing Accuracy	10%	2%	2.95	0.005
Shooting Accuracy	15%	3%	4.17	0.0004

Discussion

These results suggest that the performance-based learning strongly improves basic basketball skill in 10–12-year-old youth. The paired t-test results showed that the experimental group (participating in performance-based learning activities) recorded

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significant improvement in dribbling speed, passing accuracy and shooting accuracy as outlined in Table 3. These improvements were even more marked than the those seen in the control group, which undertook standard forms of training. Specifically this work underscores a wealth of research supporting the positive impact of performance-based learning on technical and tactical elements in youth.

The results of the paired t-test showed that all the measured skills were significantly enhanced in experimental group ($p<0.05$). Based on the ANOVA 3x2 analysis involving the testing time factor of dribbling, passing accuracy and shooting percentage parameters revealed a statistically significant reduction in dribbling time; improvement in pass accuracy higher shot % for the experimental group after their additional 8-week training program. This is consistent with the discoveries of (Ali, 2011) who proved that employing game-like situations in training results in drastic increase in skill execusion and making decisions under pressure. Performance-based learning does not only improve technical skills, but is also related to tactical decision-making and should be developed so that players can be successful in real-game situations (Afrouzeh et al., 2017).

The results of independent t-test also indicated that there were significant differences between the experimental group and control in favour of the experimental group for all skills - in terms of reduction in time for dribbling or percentage change into 1 and shooting accuracy; respectively (all $p < 0.05$) (Table 4). With t-values between 2.95 and 4.17, indicating considerable additional skill improvement using the performance-based approach compared with the typically used training of performers. This is a finding supported by (Marsh et al., 2007; Hassan & Abdulkareem, 2026) who investigated performance based versus traditional team-sport training and found that a performance-based approach to training resulted in significantly higher athletic performances — especially when the practice mirror real-game situations.

Furthermore, the direct verbal feedback given to players during the learning with performance drills were paramount in reinforcing skill mastery (Mornell et al., 2025). state that immediate feedback will speed up the learning process as actions can be made immediately during that learning periodios. Control group the control group, which received traditional drills that emphasized isolated skill practice without any situational decision-making demonstrated a clear lack of progress in this feedback mechanism. This is in line with the conclusion by (Mikołajec et al., 2025; Hassan & Abdulkareem, 2025) that traditional approaches are generally helpful for understanding standard skills but not competitive decision-making needed in sports.

The For this reason, the results from the current study help to reinforce conclusions reached by (Farias & Mesquita, 2022), in which its effectiveness on youth sports performance was analysed. The researchers found that real-time games that contain both

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practice of a motor skill and engagement of the brain in decision-making related to the learning of that skill were significantly more effective for learning than either physical therapy alone or game-based training with specific shapes. This method not only allows athletes to establish physical mastery but also psychological preparedness which is crucial in a high-demanding environment.

Additionally, (Gil-Arias et al., 2019) Connecting the Dots and drawing a direct line to improvement in sports performance by incorporating tactical decision making into training routines has also been highlighted by (Abdulkareem & Ali Hassan, 2025) The tactical training elements, which were not included in the traditional drills used with the control group, that this study incorporated into game-like scenarios was what allowed the experimental group to benefit from regular decision-making practice.

Conclusions

Based on this study, a performance-based learning approach successfully enhances the basic set of basketball skills in youth 's sports athletes between 10 to 12 years old. Results- The experimental group, which played games based on the performance improved more in dribbling speed, passing accuracy and shooting accuracy than did the control group. The findings indicate that the use of game-like scenarios and immediate performance feedback results in improved skill acquisition compared to traditional training approaches as a result.

Performance-based learning enhanced not only the technically necessary skills, but also basketball specific tactical decision-making, and reaction time for high-level basketball success. It also elicited greater gains than the previous protocols that relied on traditional resistance training with isolated exercise.

Recommendations

Performance based learning could be included in the training programme of trained coaches for developing youth 'technical and tactical skills. For this, he throws in game-like situations in which his players are instantly told how they have performed verbally so that there can be an improvement decision making and situational awareness to succeed in competitive environments. Furthermore, training should take place not only in single-skill practice but in contexts where athletes need to apply those skills under pressure and with the manifold game-type dynamics.

It is suggested that future studies consider the long-term effects of performance-based learning on retention of skills and competitive performance over time. Expanding the

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sample to more heterogeneous participants and different sports might help us get more evidence for these effects.

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The Reality of Artificial Intelligence Utilization in Administrative Work in Iraqi Sports Clubs from the Perspective of Administrative Board Members

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Abstract

This research aimed to develop , apply and identify the reality of artificial intelligence (AI) utilization in administrative work in Iraqi sports clubs from the perspective of administrative board members . The researcher adopted the descriptive survey methodology as it was appropriate for the nature of the research problem . The research sample consisted of (190) administrative board members representing (20) Iraqi sports clubs participating in the Iraqi Professional League . The sample was divided into three sub samples : a pilot sample of (5) members a construction sample of (95) members and an application sample of (90) members. The researcher constructed the scale by formulating (25) items distributed across five domains. A pilot study was conducted followed by statistical analysis to verify the validity and reliability of the scale where one item was removed during the validation process resulting in a final scale consisting of (24) items. The reliability of the scale was confirmed using Cronbach's alpha coefficient, which reached (0.963) indicating a high level of internal consistency. The final scale was then applied to the application sample and the results showed that the level of AI utilization in administrative work within Iraqi sports clubs is relatively low. The researcher concluded that sports clubs still rely on traditional administrative methods and face challenges in adopting AI technologies and recommended enhancing technological infrastructure providing training programs, and developing strategic plans to support AI adoption in sports club management.

Keywords Artificial Intelligence, Administrative Work, Sports Clubs, Administrative Boards, Iraq.

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Introduction

Artificial Intelligence (AI) has become a fundamental driver of transformation in modern organizations significantly influencing administrative processes decision making and organizational performance .With the rapid advancement of digital technologies organizations are increasingly adopting AI applications to enhance efficiency accuracy and strategic planning. AI enables organizations to process large volumes of data support evidence-based decisions and improve overall administrative effectiveness (Stuart Russell & Peter Norvig , 2021) .

In the context of management, AI contributes to optimizing administrative work by automating routine tasks , enhancing communication systems and improving performance evaluation processes . These capabilities allow organizations to reduce operational costs and increase productivity while maintaining high levels of organizational efficiency (Thomas H. Davenport & Rajeev Ronanki, 2018). Furthermore , AI supports innovation in management practices and enables organizations to respond effectively to dynamic and competitive environments.

The significance of AI utilization in sports management has grown considerably particularly within sports clubs which represent essential components of the sports system. Sports clubs require modern administrative approaches to cope with technological developments and increasing competition . The integration of AI into administrative work can enhance decision making quality , improve resource allocation and support organizational sustainability . Moreover , AI can contribute to developing more efficient administrative systems that align with contemporary management trends (Michael Haenlein & Andreas Kaplan, A., 2019) .

Despite the growing importance of AI, many sports clubs especially in developing countries such as Iraq still face challenges in adopting and utilizing AI technologies effectively. These challenges may include limited technological infrastructure insufficient technical expertise and a lack of strategic vision for digital transformation. As a result , administrative work in many sports clubs may still rely on traditional methods which can limit efficiency , innovation and decision making quality.

Accordingly , the problem of this study lies in the lack of clear understanding of the extent to which AI is utilized in administrative work within Iraqi sports clubs. Therefore , the research seeks to answer the following question: What is the reality of artificial intelligence utilization in administrative work in Iraqi sports clubs from the perspective of administrative board members ?

In light of the above, the study aims to : Develop and apply a measurement scale and identify the reality of artificial intelligence utilization in administrative work in Iraqi sports clubs from the perspective of administrative board members.

Previous Studies :Davenport T. H., & Ronanki, R. (2018) examined the use of artificial intelligence in organizations and found that AI applications improve administrative efficiency and decision-making processes but many institutions face challenges in implementation due to limited expertise and unclear strategies.

Haenlein, M., & Kaplan, A . (2019) analyzed the development of artificial intelligence and emphasized its role in transforming management practices highlighting that organizations need both technological infrastructure and cultural readiness for successful AI adoption .

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Wamba , S. F., et al . (2020) investigated AI adoption in organizations and concluded that AI significantly enhances organizational performance and data driven decision making especially when supported by strong technological capabilities .

Ransbotham, S., et al . (2017) studied AI implementation in business environments and found that organizations with higher AI maturity achieve better performance while others struggle due to lack of skills and strategic alignment .

Method and Tools

The researcher adopted the descriptive approach using the survey method, as it is appropriate for the nature of the research problem.

The research sample consisted of selected Iraqi sports clubs, totaling (20) clubs representing the Iraqi Professional League, with (190) administrative board members. The sample was divided into three sub-samples: a pilot sample consisting of (5) members, a construction sample consisting of (95) members, and an application sample consisting of (90) members.

Research tools and means of collecting information

The description of the tools used in the research gives an indication of the need for them in all field procedures (Rahim, 2024, p14), as the following were adopted: sources, the Internet, forms, laptop, SPSS program.

Field Research Procedures

Defining the Scale Items

After reviewing a number of sources and studies related to the subject of the study, and some related previous studies, the researcher suggested (27) statements as shown in Table:(1)

Table 1. shows the statements of the artificial intelligence scale

Numbers	phrases	Strongly agree	Agreed	Neutral	Disagree	Strongly disagree
	Domain 1: Strategic Planning Using AI					
1.	The club uses AI tools to support strategic planning processes.					
2.	AI applications are used to analyze future trends in sports management.					
3.	The club relies on AI in developing long-term administrative plans.					
4.	AI contributes to improving decision-making in strategic planning.					
5.	The club integrates AI technologies into its administrative planning systems.					
	Domain 2: Decision-Making Efficiency					

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6.	AI is used to support administrative decision-making processes.	
7.	AI helps in providing accurate data for making decisions.	
8.	The club relies on AI systems to reduce errors in decisions.	
9.	AI contributes to faster administrative decision-making.	
10.	AI enhances the quality of decisions within the club.	
	Domain 3: Administrative Performance Improvement	
11.	AI is used to improve administrative performance in the club.	
12.	AI applications help in evaluating staff performance.	
13.	AI contributes to increasing administrative efficiency.	
14.	The club uses AI to monitor and improve work processes .	
15.	AI supports continuous improvement in administrative work .	
	Domain 4 : Resource Management	
16.	AI is used to manage financial resources effectively	
17.	AI contributes to optimizing the use of human resources	
18.	The club uses AI systems to allocate resources efficiently	
19.	AI helps in reducing waste of administrative resources	

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20.	AI supports better management of club facilities and assets	
	Domain 5 : Communication and Information Systems	
21.	AI improves communication within the administrative structure	
22.	The club uses AI based systems for information management	
23.	AI helps in facilitating communication between departments	
24.	AI enhances data storage and retrieval processes	
25.	The club relies on AI technologies to improve administrative communication systems	

Exploratory Experiment

After completing the construction of the scale in an integrated manner with the instructions form, and before applying it to the main sample, a pilot experiment must be conducted on a number of individuals from the research sample and from outside the construction and application sample. The pilot experiment was conducted on (20/10/2025) in order to know the extent of the clarity of the instructions, the time for answering, and to know any difficulties or problems to avoid them during application (Haider, Salah, 2023, p9).

Scientific Foundations of the Scale

First: The discriminatory ability of the statements

The goal of analyzing the statements is to keep the statements with high discrimination, which are the good statements on the scale (Al Shafee, 2019, p8) as shown in Table (2).

Table 2. shows the discriminatory ability of the scale items between the upper and lower groups

Number	Group	mean	Std. Deviation	Test	*Sig	Result
1	Upper lower	4.55 2.40	0.51 0.68	9.87	P < 0.001	Significant
2	Upper lower	4.60 2.55	0.49 0.72	10.21	P < 0.001	Significant
3	Upper lower	4.48 2.70	0.57 0.75	8.94	P < 0.001	Significant

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Number	Group	mean	Std. Deviation	Test	*Sig	Result
4	Upper lower	4.52 2.65	0.53 0.70	9.56	P < 0.001	Significant
5	Upper lower	4.40 2.80	0.60 0.74	8.75	P < 0.001	Significant
6	Upper lower	4.35 2.90	0.58 0.69	7.92	P < 0.001	Significant
7	Upper lower	4.50 2.60	0.55 0.73	9.33	P < 0.001	Significant
8	Upper lower	4.47 2.70	0.52 0.71	9.10	P < 0.001	Significant
9	Upper lower	4.58 2.55	0.50 0.69	10.05	P < 0.001	Significant
10	Upper lower	4.42 2.85	0.59 0.76	8.20	P < 0.001	Significant
11	Upper lower	4.60 2.50	0.48 0.70	10.44	P < 0.001	Significant
12	Upper lower	4.38 2.95	0.61 0.72	8.05	P < 0.001	Significant
13	Upper lower	4.46 2.75	0.54 0.74	8.91	P < 0.001	Significant
14	Upper lower	4.59 2.60	0.49 0.71	10.10	P < 0.001	Significant
15	Upper lower	4.50 2.70	0.53 0.75	9.20	P < 0.001	Significant
16	Upper lower	4.41 2.85	0.57 0.73	8.33	P < 0.001	Significant
17	Upper lower	4.48 2.80	0.55 0.72	8.76	P < 0.001	Significant
18	Upper lower	4.52 2.65	0.52 0.74	9.41	P < 0.001	Significant
19	Upper lower	4.43 2.90	0.58 0.76	8.12	P < 0.001	Significant
20	Upper lower	4.56 2.60	0.50 0.70	9.88	P < 0.001	Significant
21	Upper lower	4.47 2.75	0.54 0.72	8.95	P < 0.001	Significant
22	Upper lower	4.60 2.55	0.49 0.71	10.30	P < 0.001	Significant
23	Upper lower	4.44 2.85	0.56 0.73	8.60	P < 0.001	Significant
24	Upper lower	4.51 2.70	0.53 0.74	9.25	P < 0.001	Significant
25	Upper lower	4.49 2.80	0.55 0.72	8.80	P < 0.001	Significant

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Second: Internal consistency coefficient

Internal consistency aims to verify the degree of homogeneity and consistency of the statements in the study of the phenomenon under study (Raheem, 2025, p7). All statements appeared consistent except for statement number (10) because it was higher than the significance level (0.05), as shown in Table.(4)

Table 3. shows the correlation coefficients between the scale items and the total scale score using the internal consistency method

Number	Connections	*sig	Result	Number	Connections	*sig	Result
1	.598**	P < 0.001	Significant	14	.874**	P < 0.001	Significant
2	.793**	P < 0.001	Significant	15	.756**	P < 0.001	Significant
3	.741**	P < 0.001	Significant	16	.987**	P < 0.001	Significant
4	.852**	P < 0.001	Significant	17	.654**	P < 0.001	Significant
5	.963**	P < 0.001	Significant	18	.954**	P < 0.001	Significant
6	.951**	P < 0.001	Significant	19	.784**	P < 0.001	Significant
7	.753**	P < 0.001	Significant	20	.742**	P < 0.001	Significant
8	.784**	P < 0.001	Significant	21	.658**	P < 0.001	Significant
9	.796**	P < 0.001	Significant	22	.987*	P < 0.001	Significant
10	.108	P < 0.001	Significant	23	.732**	P < 0.001	Significant
11	.985**	P < 0.001	Significant	24	.852**	P < 0.001	Significant
12	.784**	P < 0.001	Significant	25	.965**	P < 0.001	Significant
13	.854**	P < 0.001	Significant				

Third: Scale Reliability

Cronbach's alpha coefficient was calculated using SPSS to assess the reliability of the scale based on a construction sample of (95) members. The result showed a high reliability coefficient of (0.963), indicating strong internal consistency at a significance level of (0.05).

Applying the scale

After the above procedures, the researcher, along with the assisting work team, applied the scale to the research sample, which consisted of (90) members staff, for the period from (22/12/2025) until (20/01/2026).

Results

Table4. shows the presentation of statistical data for the research sample specifications

The scale	Mean	Std. Deviation	Torsion coefficient
Artificial intelligence scale	78.707	3.497	0.274

To calculate the significance of the questionnaire, the hypothetical mean was found using the following formula (Jawdah, 2008, p. 178):

Hypothetical mean = (Total of alternatives ÷ Highest score for alternative) x Number of items on the scale

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Therefore, the hypothetical mean of the entire questionnaire = (1+2+3+4+5) ÷ 5) x 24 = 72

Table5. shows the arithmetic mean, hypothetical mean, standard deviation, calculated T-value, true significance, and type of difference.

The scale	mean	Std. Deviation	Test	Sig	Result
Artificial intelligence scale	78.707	3.497	15.786	P < 0.001	Significant
hypothetical mean				72	

Discussion

The results of the study indicated that the level of artificial intelligence (AI) utilization in administrative work within Iraqi sports clubs was not statistically high . This finding suggests that the adoption and effective implementation of AI technologies in administrative processes remain limited .

This result can be interpreted in light of the challenges associated with AI adoption in developing organizational environments . According to Thomas H . Davenport and Rajeev Ronanki (2018) many organizations face difficulties in implementing AI due to a lack of clear strategies insufficient technical expertise, and limited organizational readiness . These factors may explain the relatively low level of AI utilization observed in Iraqi sports clubs .

Furthermore , Michael Haenlein and Andreas Kaplan (2019) emphasized that the successful integration of AI requires not only technological infrastructure but also a cultural shift within organizations . Resistance to change and reliance on traditional administrative methods may hinder the adoption of AI in sports organizations .

In addition, Stuart Russell and Peter Norvig (2021) pointed out that AI systems depend heavily on data availability and quality . In many developing contexts limited access to structured data and digital systems may reduce the effectiveness of AI applications which could contribute to the current findings .

The researcher attributes these results to several factors , including limited financial resources , lack of specialized training in AI technologies and insufficient awareness of the importance of digital transformation in sports administration. Moreover , the absence of clear policies supporting AI adoption may further restrict its implementation .

Overall , the findings highlight the need for developing strategic plans , enhancing technological infrastructure and providing training programs to support AI integration in administrative work within Iraqi sports clubs .

Conclusions

1. The degree of the use of artificial intelligence in administrative activities in sports clubs in Iraq is rather small
2. The sports clubs continue to use mostly the classical administrative approach rather than the modern one that uses AI
3. There are no sufficient technical capabilities needed for the successful functioning of AI

4. The members of the administrative boards do not possess sufficient knowledge about the use of AI in management
5. The lack of appropriate strategic planning is another impediment to AI use in the field of sports
6. Insufficient financing can be considered one of the main obstacles to AI implementation

Recommendations

1. Formulation of strategies in order to implement artificial intelligence in sports club administration
2. Arrangement of training programs and workshops to increase awareness among the administrative employees regarding the use of AI
3. Enhancement of the technology used in sports clubs in order to adopt AI
4. Utilization of funds to be spent in digitalization process and artificial intelligence adoption
5. Motivating sports clubs to implement modern administrative systems based on the use of AI technologies
6. Collaboration with technological institutes to facilitate adoption of AI
7. Future research on the relation between AI and other variables such as organizational performance and decision-making

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Physical activity and weight reduction in female recreational participants

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Abstract

Twenty healthy female recreationalists between 18 and 33 years of age, who expressed their intention to reduce their percentage fat mass with weight loss, were recruited in the study. Alterations in body composition were evaluated using five key variables: body mass index (BMI), body mass (BM), percentage of fat (BF %), total muscular tissue (%MT), and percentage of water (%W). Measurements were made at three time points including the start of the study before (baseline), after the second month of intervention and at end of forth month (conclusive). Five times a week, the group worked out for 90 minutes, usually in the morning. The T-test of small dependent samples was used to evaluate the differences between initial and control measurements, between control and final measurements, and between initial and final measurements. Based on the results, it can be said that the ultimate objective a reduction in body mass index (BMI), body mass (BM) and body fat percentage (%BF) was accomplished.

Keywords: body mass index (BMI), body mass (BM), muscular tissue (%MT), percentage of fat (BF %) and percentage of water (%W)

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Introduction

Obesity has a detrimental effect on nearly all bodily functions and presents a major threat to public health (Brewer CJ, Balen AH. 2010 and Diyar Muhammed Ali. 2025). It increases the risk of different health issues such as cardiovascular disease (Singh, G.M, et al 2013 and Czernichow, et al. 2011) diabetes (Singh, G.M, et al 2013), cancer (Lauby-Secretan, B., et al 2016), musculoskeletal disorders (Anandacoomarasamy, A., et al., 2008.), and mental health problems (Anstey, K.J., et al., 2011). (Okunogbe et al., 2022) that more than 1.9 billion adults aged 18 and older were overweight, while over 600 million were categorized as obese. Around 13% of adults globally were classified as obese in 2014, consisting of 11% of men and 15% of women. In 2014, almost 40% of adults aged 18 and older were classified as overweight, with comparable percentages for both males and females. From 1980 to 2014, obesity rates worldwide more than doubled according to the (GBD 2021). It is widely understood that obesity is a result of a lack of physical activity. Genetics, energy intake, food selection, food preparation methods (baking, frying, cooking), portion size, and meal timing must also be taken into account. Based on (Viner, R.M. & Cole, T.J. 2005), the risk of adult obesity can increase by 7% for 5-year-old children with each extra hour of TV watching on weekends. (Dietz, W.H. Jr. & Gortmaker, S.L. 1985) identified a notable connection between the amount of TV watched and the incidence of obesity. (Marshall, S.J., et al. 2004) disapprove of these claims, as their research shows that media use and physical activity only explain 1% of the variation in body fatness, which is somewhat unusual. According to (Wilmore, J.H. & Costill, D.L. 2004) lack of physical activity is as significant a factor in obesity as overeating. According to (Greene as cited in Petrović, J., 1992), the main cause of obesity in 67% of obese individuals is reduced physical activity, while overeating only contributes to 3%. Everyone can engage in physical activity without negative health consequences, such as the need for medication or surgery, to decrease body fat, as stated by (Samaras, K., et al. 1999) Abdominal fat, in particular, is believed to respond better to exercise compared to fat in other areas of the body. According to (Samaras and Campbell 1997) argue that it is easier to mobilize abdominal fat during exercise compared to fat in other areas of the body. In the opinion of (McArdle, W.D.,

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Katch, F.I.&Katch, V.L. 2005), engaging in physical activity is the sole method to "normalize" the raised set point level and maintain a lower body mass. Another established fact is that when energy intake is decreased, there is a noticeable decrease in muscle tissue, as the body utilizes it for energy in the absence of carbohydrates, as explained by (Bernadot, D. 2000). According to (Weinheimer., et al 2010), weight loss due solely to calorie restriction results in a decrease in fat-free mass.

Method

Subjects

The investigation was carried out at a fitness gym in Garmian, Iraq, between May 20 and July 20, 2024. The study comprised 20 female volunteers aged 18 to 33 years who all wanted to lose weight and reduce their body fat percentage. In order to monitor changes in body composition, four parameters were measured using body analysis equipment called GS6.5 B. S161118S1544. Body mass index (BMI), body mass (BM), body fat percentage (%), water percentage (%W), and muscle tissue percentage (%MT).

Participants worked out for 75 minutes five days a week, mostly in the mornings, to increase their metabolic rate. Heart rate was determined manually using the formula 220 - age = maximal heart rate, as indicated by Medved et al. (1987), which is still used as a standard reference. After calculating the maximum heart rate, it was concluded that exercising at 30% of that current would be beneficial, as it is commonly understood that fat is processed aerobically. Heart rates were obtained at the end of each workout session. The majority of the training sessions consisted of aerobic activities and the usage of cardiovascular equipment. The program began with a brief warm-up, The procedure involved beginning with a brief warm-up followed by 10 minutes on a treadmill for cardiovascular exercise before moving on to the next exercises. The participants exercised for 30 minutes on a treadmill under the same conditions (30% of maximum heart rate), followed by workouts targeting the chest, biceps, triceps, back, legs, and abdomen. 30% of the weight is utilized in exercises for major muscle groups such as chest, back, and legs, while exercises for smaller muscle groups like biceps, triceps, are done using 25-30% of the maximum number of repetitions.

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Nutrition

They received guidance to modify their daily dietary habits by opting for various food items and cooking techniques. It was recommended that individuals refrain from consuming juices during the day and instead opt for water, unsweetened tea, and soups, while also including fresh fruits and vegetables in their meals.

Breakfast	Snack	Lunch	Snack	Dinner
At 7-8:30 Am	At 10 -10:30am	At 12 – 12:30 pm	At 2 -3pm	At 5:00 – 7:30pm
Egg Dark Bread Oatmeal Yogurt Avocado Toast Walnuts Almond Peanuts Milk Coffee Green Tea Black Tea Berry Banana Tomato Cucumber Lettuce	Any Fruits The Best One Is: Kiwi Carrot Pears Apricot Green Apple Berry Avocado Grape Fruit	Meat, Soup, 8 Tbsp. Of Rice or Soup With Half Bread and Salad or Fish With Salad Twice Week or Grill Chicken with Salad 3 Times A Week or Red Meat with Salad Twice Week	2 Glass of Water with 5 Almond	Any Soup with Half Bread and Salad or Chicken With Salad or 4 Boiling Eggs with Salad and Half Bread or At 8 Pm Until Bed Time, You Don't Have to Eat Anything Except Water You Have to Drink 4 - 5 Glass of Water till Bed Times Before Bed You Have to Drink One Cup of Green Tea Without Sugar

Statistical analysis

This study considered five factors: body mass index (BMI) body mass (BM), percentage of body fat (% BF), and water percentage (% W). To determine when the changes occurred, the participants were assessed three times: before the exploration began (initial measurement), at the end of the second month (control measurement), and at the end of the third month (final measurement). Descriptive statistics and a T-test for small

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dependent samples were used to analyze the differences between the initial and control measurements, control and final measurements, and initial and final measurements. The outcomes are displayed in tables and charts.

Research purpose

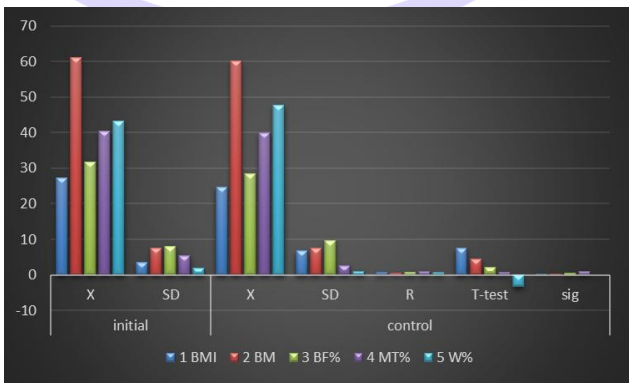
The purpose of the research was to see if the workout routine designed for female recreational participants would result in a reduction in body mass (BM) and body fat percentage (%BF), and additionally an increase in muscle tissue percentage (%MT) and water percentage. Furthermore, we attempted to determine the period of time required to see changes in body composition, which is equally important.

Results

The outcomes of the research are illustrated in three tables and one graph. It can be inferred that both weight and body fat percentages are consistently decreasing, whereas the percentages of water and muscle mass are on the rise. A T-test for small dependent samples was employed to assess statistical significance and the timing of these changes. Table 1 presents a T-test comparing initial and control measures, Table 2 compares control and final measurements, and Table 3 contrasts initial and final measurements.

Table 1 changes mean between the initial and control groups, female weight-loss (n=20).

		initial		control				
	Variables	X	SD	X	SD	R	T-test	sig
1	BMI	27.32	3.45	24.8	6.78	0.65	7.43	.01
2	BM	61.21	7.54	60.11	7.43	0.58	4.37	.00
3	BF%	31.76	8.12	28.43	9.54	0.83	2.1	.57
4	MT%	40.35	5.32	39.87	2.65	0.99	0.79	.98
5	W%	43.33	1.89	47.61	0.98	0.64	-3.38	.00



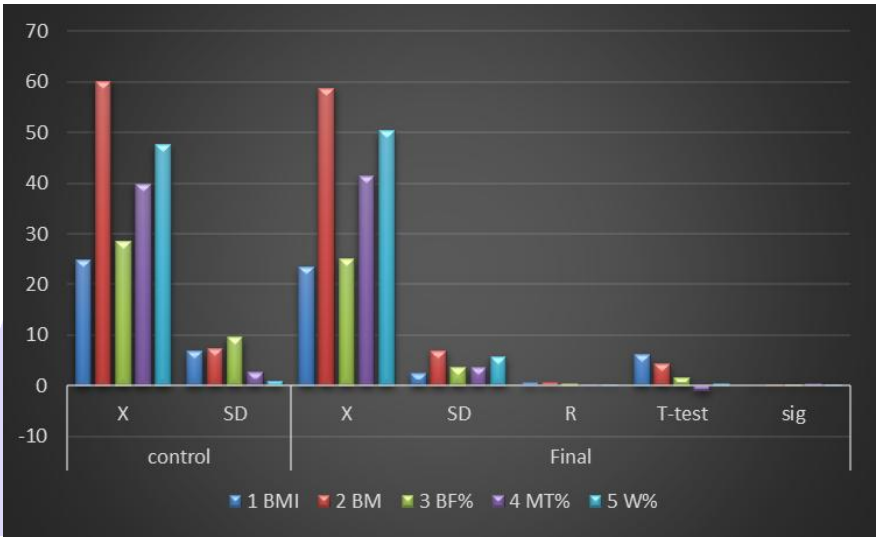
Graphic 1. Results in initial, control at the group of females that want to lose weight

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Table 2 change means between control and final within a female weight-loss (n=20).

		control		Final				
	Variables	X	SD	X	SD	R	T-test	sig
1	BMI	24.8	6.78	23.5	2.43	0.60	6.11	.00
2	BM	60.11	7.43	58.76	6.91	0.65	4.37	.01
3	BF%	28.43	9.54	25.09	3.54	0.42	1.65	.23
4	MT%	39.87	2.65	41.34	3.65	0.26	-0.96	.38
5	W%	47.61	0.98	50.31	5.72	0.11	0.42	.16

Graphic 2. Results in control and final at the group of females that want to lose weight



Based on the data, it can be assumed that there were considerable changes in body mass index (BMI), body mass (BM) and water percentage (%W) at a level of .00 to .01 between the first and control measurements (see table 1). In particular, the average water percentage has risen from 43.33% to 47.61%, although the average (BMI) decreased from 27.32 kg/m^2 to 24.8 kg/m^2, although body mass has dropped from 61.21 kg to 60.11 kg. The importance of the variations found using the arithmetic method in the control and final measurements is shown in Table 2. The findings show that just two variables, body mass index (BMI), body fat percentage (%BF) exhibits significant variations at the.00 to .01 level. Moreover, increased in muscle tissue with body water percentage are two additional variables that show beneficial effects.

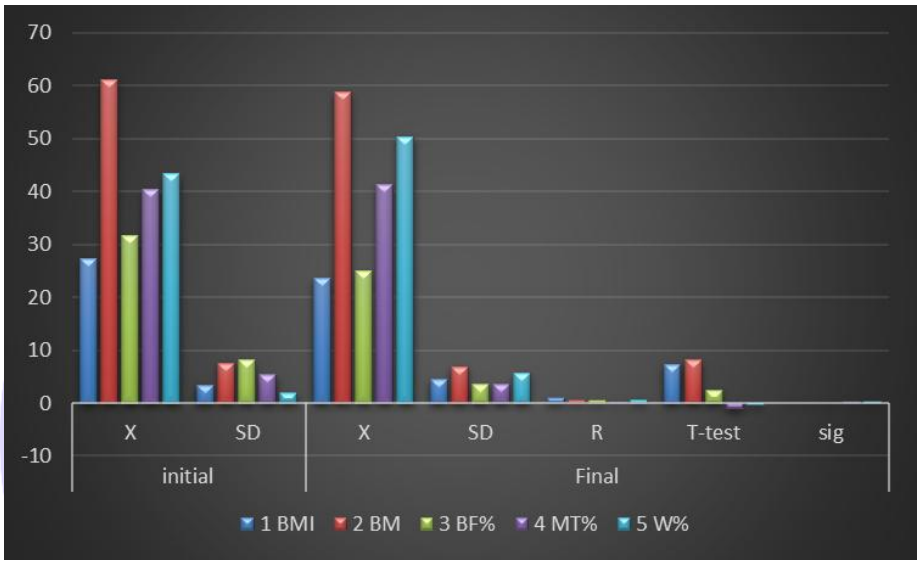
Table 3 demonstrates the significance of the differences in the arithmetic method between the initial and final measurements. According to the data, they are three variables—(BMI), (BM) and the percentage of fat tissue (% BF) at the 00 levels exhibit notable differences. While there are enhancements in the other two variables (the percentage of water (%W), and the percentage of muscle tissue (%MT), these changes are not statistically significant.

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Table 3: initial and final among the female group members who wished to reduce their body weight

		initial		Final				
	Variables	X	SD	X	SD	R	T-test	sig
1	BMI	27.32	3.45	23.5	4.43	0.94	7.37	.00
2	BM	61.21	7.54	58.76	6.91	0.57	8.09	.00
3	BF%	31.76	8.12	25.09	3.54	0.50	2.43	.00
4	MT%	40.35	5.32	41.34	3.65	0.20	-1.04	.24
5	W%	43.33	1.89	50.31	5.72	0.68	-0.42	.31

Graphic 3. Results in initial and final at the group of females that want to lose weight



The alterations in all five variables are also visually represented in Graphic 4, where the changes are immediately apparent. All five variables are depicted on the X-axis, alongside three measurements (initial, control, and final). The Y-axis illustrates the values of all five variables in addition to the values from the three measurements (initial, control, and final).

Graphic 1. The results in initial, control and final measurements groups of females they want to lose weight

Discussion

This study used the body analysis equipment GS6.5 B. S161118S1544 to measure five variables: body mass index (BMI), body mass (BM), body fat percentage (%), water percentage (%W), and muscle tissue percentage (%MT) in order to track changes in body composition. The results of this study suggest that, when comparing initial and final measurements after four months of physical activity, statistically significant differences are only seen in three parameters: body mass index (BMI), body mass (BM), and body fat percentage (%BF) at significance levels of.00. On the other hand, the two other metrics (the percentage of muscle tissue (%MT-1.04) and the percentage of water (%W-0.42) exhibit improvements, but they fall short of the threshold for statistical significance. For four

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months, the participants worked out to begin with things in the morning to speed up their metabolic system all through the day. After a month, the control estimation appears to be the primary sign of weight reduce. Concurring with Venables, M.C., et al. (2008), four weeks of workouts (three times a week) at an escalated rise to their personal fat-max, or zone in which their fat oxidation is at its greatest, is required to progress fat oxidation (and affront affectability),a 12-week program is recommended Christiansen et al. (2010). Divergent views exist not only about the length of time needed to lose weight but also regarding the amount of time spent exercising daily and weekly, as well as the level of intensity. The Institute of Medicine (2002) suggests engaging in moderate-intensity physical activity for 60 minutes each day. However, independently, Saris, W.H., Blair, S.N. & Van Baak, M.A. (2003) and Weinsier, R.L. et al. (2002) asserted that maintaining body weight and achieving long-term weight loss required 60 to 90 minutes of brisk walking per day. According to Bouchard, C., Despres, J.P., & Trembluy, A. (1993), exercising for at least an hour per day is essential for effective weight loss. Because fat is digested in aerobic settings, the subjects in our study practiced for 90 minutes, five times a week, primarily performing aerobic exercises and cardio gadgetry activities. Because "fat is burning on the fire of carbs," they periodically created gadget exercises using modest weights (30% of their weight) and more repetitions. According to Petrović, J. (1992), engaging in physical activity while trying to lose weight has two benefits: first, it makes it easier to mobilize fatty acids from fat reserves because fat cells are more sensitive to lipolytic stimuli; second, it lowers insulin levels, which eliminates its effect on lipogenesis. When Katch, F.I., and McArdle, W.D. (1993) assessed the fat cell width, they found that it had decreased by 18% after six months of running five times a week compared to the inactive period.As anticipated, exercise has a greater impact and increases fat oxidation the longer it lasts. Schutz, Y., et al (2014) have shown that energy consumption rose considerably ($p < 0.01$) as the amount of time spent walking prescribed increased. Overall energy expenditure increased by 3% (30-min prescription), 6% (60-min prescription), and 9% (90-min prescription) on average when walking was prescribed. Achten, J. & Jeukendrup, A. E. (2003) discovered that moderate exercise intensity (62–63% of VO2max or 70–75% of HRmax) was the ideal intensity for fat oxidation in a group of trained individuals, while Jeukendrup, A.E. & Wallis, G.A. (2005) found that it was approximately 50% of VO2max for less trained individuals. According to Skrypnik, D., et al (2015), 2 groups of obese women engaged in endurance and endurance strength training did not differ statistically significantly in terms of body composition. These results contradict previous research by Willis, L.H., et al. (2012) and Marzolini, S., Oh PI & Brooks, D. (2012), which found that mixed endurance strength exercises were more effective than endurance exercises in terms of body mass and body fat percentage. Body mass index (BMI) and body mass (BM) decreases consistently from initial to final measurements, with statistical significance at levels of .01,.00, .00,.01 and.00, respectively. The variable percentage of body fat (%BF) shows a consistent decrease, which is statistically significant even after 4 months at a level of .00. Shukova-Stojmanovska, D.,

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Dimeski, F., & Protić-Gava, B. (2014) found that increases in body fat percentage occur earlier, at the control measurement (after 2 months). According to Christiansen et al. (2010), there are no gender differences in weight loss. However, Petrović J (1992) found that females can mobilize fat tissue for energy more effectively, which is supported by our research. Venables, M.C., Achten, J., & Jeukendrup, A.E. (2005) found that women have a higher rate of fat oxidation at higher intensities than men, which is surprising given that men tend to use carbohydrates as energy at that intensity. Women consume somewhat more energy from fat oxidation during the day than males. Carmichael, H.E., Swinburn, B.A., & Wilson, M.R. (1998) recommended that obese women lose weight by reducing fat intake and increasing physical activity for three months. Reducing fat consumption from 36% to 22% resulted in a drop in body mass. Women who reduced their fat consumption by 40 grams per day lost the highest body mass over the three-month study. Participants were informed that, according to Wilmore, J.H. and Costill, D.L. (2004), adequate water intake is necessary for effective weight loss. The percentage of water (%W) increased from initial to control measurements, which was statistically significant at the.00 level (see table 1). After the second month, there is a plateau when the values from control to final measurement are similar but not statistically significant.

Although not statistically significant, there are improvements in the percentage of muscle tissue (%MT) between the initial and final measurements. Table 2 shows that over the first two months, there was a slight decline in the proportion of muscle tissue (on the control measurement). Although this variable has increased in the second half (final measurement), it is still not statistically significant. According to Chomentowski, P., et al. (2009), those who restrict their energy intake may see a drop in the proportion of muscular tissue since their body will use it as energy if they don't get enough carbohydrates. According to Weinheimer, E.M., et al. (2010), strength workouts are recommended to prevent the loss of muscle tissue since they increase muscular strength, power, and endurance and ultimately increase muscle mass, as demonstrated by this study. It is possible to draw the conclusion that the situation occurred because the body was still shocked by the restricted energy intake in the first half. The individuals become accustomed to the energy level after four months, which explains the final increase in that variable (%MT).

conclusion

Regular exercise, five times a week, causes a decrease in body mass index, body mass and body fat percentage. According to the findings and description of this study (table 1), there was a statistically significant improvement in the percentage of water (%W) at a level of.00 and a decrease in body mass index (BMI) and body mass (BM) at a level of.01 and .00 respectively from the initial control measurement. they are body mass index (BMI), and body mass (BM), fell statistically significantly (.00, .01) respectively between control and final measurements (table 2), while (BMI), (BM) and the percentage of body fat (%BF)

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reduced between starting and final measurements (table 3) at statistically significant levels of (.00, .00, and.01) (table 3).

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The Effectiveness of a Hydrotherapy-Based Rehabilitation Program in Improving Range of Motion and Muscle Strength in Athletes with Partial Lateral Ankle Ligament Tears

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Abstract

The purpose of this study was to evaluate the effectiveness of a hydrotherapy-based rehabilitation program in improving the range of motion (ROM) , muscular strength and functional performance in athletes suffering from partial tears of the lateral ankle ligament. An experimental design with two groups (experimental and control) was employed on a sample of ten athletes. The experimental group underwent a structured hydrotherapy rehabilitation program for 12 weeks (three sessions per week) while the control group received traditional therapy . Range of motion was measured using a goniometer and muscle strength using a dynamometer . Functional performance was assessed using the Vertical Jump Test and the Timed Up and Go (TUG) Test . Statistical analysis revealed significant improvements in all measured variables for the experimental group compared to the control group. The results confirm the effectiveness of hydrotherapy in accelerating recovery and restoring joint function after lateral ankle ligament injury .

Keywords: Hydrotherapy, Injury Rehabilitation, Lateral Ankle Ligament Tear, Range of Motion, Team Sports .

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Introduction

Team sports such as soccer , basketball and volleyball require high physical exertion and depend heavily on complex motor skills including sprinting , jumping and sudden changes of direction. Due to the physical contact and competitive nature of these sports players are continuously exposed to injury risk. Among the most common injuries in the field are ankle injuries specifically partial tears of the lateral ankle ligaments. Such injuries negatively affect player performance and can sideline athletes for extended periods if they do not undergo comprehensive rehabilitation .

According to Brukner and Khan (2017) "ankle injuries are among the most common injuries in athletes especially those involved in team sports that require quick and sudden movements (such as soccer and basketball). Among these injuries partial tears of the lateral ankle ligament significantly affect sports performance leading to restricted range of motion and weakened surrounding musculature hindering the player's ability to return to play quickly and effectively." In this context hydrotherapy has emerged as an innovative and effective method in sports rehabilitation. Hydrotherapy provides a safe low-impact environment that allows athletes to perform exercises without imposing additional stress on the injured joint. It also improves circulation and reduces pain, thereby promoting healing and helping to restore the joint's normal range of motion (Kisner & Colby, 2017) .

Recent studies indicate that using hydrotherapy in the rehabilitation of lateral ankle injuries yields positive outcomes. For example Smith et al. (2021) demonstrated that aquatic exercises improved ankle joint range of motion by 30% in injured athletes. Similarly Johnson et al. (2010) found that hydrotherapy reduces recovery time and returns athletes to their previous performance levels faster than traditional therapies. Therefore this study aims to introduce an integrated hydrotherapy-based rehabilitation approach that not only improves ankle range of motion but also enhances muscle strength enabling injured athletes to return to play safely and effectively (American College of Sports Medicine, 2020) .

Team sports like soccer and basketball impose high biomechanical loads on the athletes joints due to complex skills such as sudden stopping , jumping and directional changes. This repetitive physical stress makes these athletes continually susceptible to sports injuries with ankle injuries at the forefront. Lateral ankle ligament injuries are common in sports requiring quick directional changes and frequent jumping (Brukner & Khan, 2017) . These injuries often result from sudden movements or twists leading to partial or complete ligament tears. Hertel (2002) noted that the absence of effective and integrated rehabilitation programs can lead to re-injury or the development of chronic conditions negatively impacting sports performance and prolonging the recovery period .

Studies also indicate that many athletes do not receive proper rehabilitation due to lack of awareness of modern rehabilitation methods such as hydrotherapy. Smith et al. (2021) reported that hydrotherapy provides a safe environment to strengthen muscles and improve range of motion without additional stress on the joint . Jones et al. (2022) also found that hydrotherapy accelerates recovery and reduces the risk of re-injury. However the lack of specialized rehabilitation programs incorporating hydrotherapy prevents athletes from benefiting fully from these modern techniques. Thus there is a clear need to develop a comprehensive rehabilitation program based on hydrotherapy for athletes with partial lateral ankle ligament tears to improve joint range of motion and muscle strength, enabling them to return to sport safely and effectively .

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1. Evaluate the effectiveness of a hydrotherapy-based rehabilitation program in improving range of motion and muscle strength in the sample participants.
2. Assess the impact of the rehabilitation program on enhancing range of motion and muscle strength of the muscles surrounding the ankle joint in the injured athletes.
3. Compare post-test results between the experimental and control groups in the studied variables.

Methodology

Design and Participants

An experimental design with two equal groups (experimental and control) was used. The target population consisted of players of team sports (soccer , basketball , volleyball) who were diagnosed with a partial tear of the lateral ankle ligament (moderate severity) in local clubs and sports centers. Ten injured athletes aged 22 to 28 years were included. Due to the limited number of available participants, a total census sampling was employed, with all eligible athletes forming the sample (100% sampling ratio) . The participants were randomly assigned to two groups of five players each : an experimental group and a control group .

The study period extended from March 1, 2024, to September 30, 2024. All interventions and assessments were conducted at the Medical Rehabilitation and Physical Therapy Center at the University of Basra, the Rehabilitation Laboratory at the College of Physical Education and Sports Sciences, and at a local Gold's Gym in Basra .

Research Instruments

- Goniometer : Used to measure the ankle joint range of motion (dorsiflexion , plantarflexion , inversion, eversion) .
- Transcutaneous Electrical Nerve Stimulation (TENS) unit : Used to reduce pain and improve circulation.
- Therapeutic Ultrasound : Used to evaluate and treat the condition of the ligaments and muscles surrounding the joint .
- Magnetic Resonance Imaging (MRI): Used to accurately determine the degree of injury severity .
- Muscle Strength Dynamometer : A hand-held dynamometer to measure muscle strength around the ankle joint .
- Hydrotherapy Equipment : Including therapeutic pools and aqua-resistance devices (e.g., aqua bands) .
- Statistical Software : Data were analyzed using IBM SPSS Statistics version 25 .

Preliminary (Pilot) Study

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A pilot test was conducted on April 15 , 2024 using two athletes outside the main sample . The pilot aimed to ensure the suitability of the equipment, the appropriateness of the aquatic exercises for the participants capabilities and the efficiency of the research team . Any issues were addressed before the main study began .

Pre-Tests

Preliminary measurements of ankle joint range of motion and muscle strength were taken on April 18, 2024 before the start of the rehabilitation program. The goniometer was used to assess joint ROM and the dynamometer was used to measure muscle strength.

Rehabilitation Program

The hydrotherapy-based rehabilitation program was implemented starting April 20, 2024 and lasted for 12 weeks (36 total sessions , 3 sessions per week) . Each session lasted approximately 45–60 minutes . The program consisted of targeted water exercises designed to improve ankle range of motion and strengthen the muscles surrounding the ankle joint . The program was initiated after the acute injury phase during which participants had received initial RICE protocol treatments (Rest , Ice , Compression , Elevation) in the first days post-injury to control swelling and pain .

Key details of the rehabilitation program : - Duration: 12 weeks with 3 sessions per week (36 sessions total) . - Session Length: 45–60 minutes. – Progression : The program was progressive with increasing exercise intensity across weeks .

Program Phases

Phase 1: Weeks 1–3 (Initial Rehabilitation)
- **Goals :** Reduce pain and inflammation , improve local circulation and begin gentle restoration of ankle range of motion .
- **Exercises:**
- *Water Walking :* Walk in the pool at waist depth for 10 minutes . This exercise promotes circulation without stressing the joint .
- *Ankle Circles in Water :* With the affected foot submerged perform circular motions of the ankle in both clockwise and counterclockwise directions 10 repetitions each way . This improves initial joint flexibility .
- *Gentle Calf Stretch :* Using the pool edge perform a calf muscle stretch (knee extended) holding 15 seconds per set 3 sets. This helps relax muscles and improve flexibility .
- **Modalities :**
- *TENS :* Applied to reduce pain and stimulate the muscles .
- *Ultrasound :* Used to expedite healing and reduce inflammation .

Phase 2: Weeks 4–6 (Improving Range of Motion)
- **Goal:** Increase ankle joint range of motion and further improve surrounding muscle strength .
- **Exercises :**
- *Aquatic Resistance Band Ankle Movements :* Attach aqua-resistance bands to the foot to perform ankle dorsiflexion, plantarflexion , inversion and eversion against water resistance. Perform 3 sets of 12 repetitions in each direction . This strengthens the muscles

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around the joint.
- *Balance Exercise in Water :* Stand on the injured foot in waist-deep water while lightly supporting oneself with the pool wall or a bar . Hold for 20 seconds. Perform 3 sets. This enhances joint stability .
- *Light Jumping in Water :* Perform gentle jumping on the spot in the water focusing on safe landings . Perform 3 sets of 10 jumps . This improves motor control .
- **Equipment :** Goniometer (to continue measuring ROM) aqua-resistance bands for added resistance .

Phase 3: Weeks 7–9 (Strength Enhancement)
- **Goal:** Increase muscle strength around the ankle and improve motor control and stability .
- **Exercises:**
- *Water Pushing :* In waist-deep water use the affected foot to push water in all directions (forward , backward , sideways) to generate resistance. Perform 4 sets of 15 repetitions . This exercise boosts muscle strength .
- *Aquatic Squats :* Perform squats in the water while maintaining balance (water height around waist or chest) . Perform 3 sets of 12 squats . This strengthens thigh and calf muscles .
- *Water Running :* Run in place in a pool at appropriate depth for 5 minutes . This improves overall fitness .
- **Equipment:** Hand-held dynamometer (for periodic strength assessments) aqua-resistance bands to increase exercise intensity .

Phase 4: Weeks 10–12 (Return to Sports Activity)
- **Goal :** Restore full functional capacity of the ankle joint and prepare the athlete to return to sports .
- **Exercises :**
- *Advanced Directional Jumps:* Perform jumping in water with directional changes (forward , sideways , backward) 4 sets of 10 jumps . This enhances explosive strength .
- *Advanced Balance Drills:* Stand on the injured foot in waist-deep water without support. Hold for 30 seconds. Perform 3 sets . This enhances neuromuscular control .
- *Fast Water Running :* Run in water at a moderate-fast pace for 10 minutes . This improves overall conditioning and readies the athlete for the playing field .
- **Equipment :** MRI (to evaluate the ligament status at program end) ; dynamometer (final strength assessment) .

Notes:
- The program was designed to be progressive with exercise intensity increasing as weeks progressed .
- Specialized equipment was used to measure progress and periodically evaluate the condition of the athletes .
- Emphasis was placed on aquatic exercises to reduce joint stress while achieving effective outcomes .

Tests and Measurement Procedures

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1. **Range of Motion (ROM) Test :** Ankle joint ROM was measured using a goniometer following the standardized protocol described by Norkin and White (2016) Movements included:
2. *Dorsiflexion :* Upward movement of the foot .
3. *Plantarflexion :* Downward movement of the foot .
4. *Inversion :* Movement of the sole toward the midline .
5. *Eversion :* Movement of the sole away from the midline .

Procedure : Participants sat on a chair with the ankle in a neutral position . The goniometer's stationary arm was aligned with the fibula and the moving arm with the metatarsals of the foot . Each movement was performed to the maximum range and the peak angle was recorded. Each measurement was performed three times and the average value was used for analysis (Norkin & White, 2016) .

1. **Muscle Strength Test :** Strength of the muscles around the ankle joint (anterior tibialis , peroneal muscles , gastrocnemius, etc.) was assessed using a hand-held dynamometer according to the protocol described by Stark et al. (2019) .

Procedure : Participants sat on a chair with the tested foot fixed. Resistance was applied by the dynamometer in the directions of dorsiflexion, plantarflexion , inversion and eversion . The maximal force that the participant could resist was recorded for each movement .

1. **Vertical Jump Test :** Participants vertical jump ability was measured using a Vertec jump meter following the standard protocol by Markovic and Sekulic (2020) .

Procedure : The participant stood alongside the Vertec device with one arm extended upwards to set a standing reach height . They then performed a maximal vertical jump and touched the device at peak height . The jump height was determined by the difference between standing reach and jump reach . These values were compared to pre-test values .

1. **Timed Up and Go (TUG) Test :** Functional mobility was assessed using the Timed Up and Go Test (Podsiadlo & Richardson, 1991) .

Procedure : The participant began seated in a chair On the command "go," the participant stood up, walked a distance of 3 meters, turned around , walked back and sat down . The total time to complete this sequence was recorded .

Statistical Analysis

Data were statistically analyzed using SPSS 25 Descriptive statistics (means and standard deviations) were calculated for all variables. Paired-sample t-tests were conducted to compare pre- and post-test scores within each group and independent-sample t-tests were used to compare post-test results between groups Significance was set at $p < 0.05$.

Results

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The results of the study are presented in three tables. Table 1 shows the pre-test and post-test outcomes for the experimental (hydrotherapy) group. Table 2 shows the pre-test and post-test outcomes for the control (traditional therapy) group. Table 3 compares the post-test results between the experimental and control groups.

Table 1. *Statistical Results of Pre-test and Post-test for the Experimental Group (n = 5)*

No.	Variable	Pre-test (Mean)	Post-test (Mean)	Difference (Post – Pre)	SD (Post-Test)	SE (Difference)	t-value	Sig. (2-tailed)
1	Range of Motion (Dorsiflexion)	36.00	44.00	–8.00	4.00	1.51	5.29	.000
2	Range of Motion (Plantarflexion)	13.50	19.50	–6.00	3.00	1.13	5.30	.000
3	Inversion	31.00	39.50	–8.50	4.25	1.60	5.01	.002
4	Muscle Strength	12.01	17.15	–5.14	2.01	0.76	6.76	.000
5	Vertical Jump (m)	0.16	0.47	–0.31	0.15	0.056	5.53	.000
6	TUG Time (sec)	30.00	12.00	18.00	5.50	1.75	10.29	.000

Note: For Range of Motion and strength, higher values indicate improvement. For the TUG test, lower time indicates improvement.

All variables showed statistically significant improvement in the experimental group ($p < .01$) following the 12-week hydrotherapy program. Each paired t-test comparing pre- and post-intervention values yielded p-values well below .05, indicating significant gains in ankle dorsiflexion, plantarflexion, inversion, muscle strength, vertical jump, and a significant decrease in TUG time.

Table 2. *Statistical Results of Pre-test and Post-test for the Control Group (n = 5)*

No.	Variable	Pre-test (Mean)	Post-test (Mean)	Difference (Post – Pre)	SD (Post-Test)	SE (Difference)	t-value	Sig. (2-tailed)
1	Range of Motion (Dorsiflexion)	37.10	39.00	–2.90	3.70	1.38	2.10	.050
2	Range of Motion (Plantarflexion)	13.80	17.10	–3.30	2.10	0.80	4.12	.014
3	Inversion	30.10	34.90	–4.80	3.30	1.25	3.84	.010
4	Muscle Strength	12.50	13.50	–1.00	1.90	0.70	2.00	.085
5	Vertical Jump (m)	0.23	0.22	–0.01	0.12	0.04	1.40	.217
6	TUG Time (sec)	27.00	25.00	2.00	5.00	1.85	2.50	.058

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In the control group, minor improvements were observed in dorsiflexion, plantarflexion, and inversion, but only plantarflexion ($p = .014$) and inversion ($p = .010$) reached significance at $p < .05$. Muscle strength and vertical jump improvements were not statistically significant ($p > .05$), nor was the improvement in TUG time.

Table 3. *Post-Test Comparison Between Experimental and Control Groups*

No.	Variable	Experimental (Post Mean)	Control (Post Mean)	Difference	Favor	Notes
1	Range of Motion (Dorsiflexion)	44.00	39.00	+5.00 ↑	Exp	Marked improvement in exp. group
2	Range of Motion (Plantarflexion)	19.50	17.10	+2.40 ↑	Exp	Good improvement
3	Inversion	39.50	34.90	+4.60 ↑	Exp	Clear difference in favor of exp.
4	Muscle Strength	17.15	13.50	+3.65 ↑	Exp	Large improvement (not significant in control)
5	Vertical Jump (m)	0.47	0.22	+0.25 ↑	Exp	Practically significant difference
6	TUG Time (sec)	12.00	25.00	–13.00 ↓	Exp	Excellent improvement (reduced time)

Table 3 shows that after the intervention, the experimental group outperformed the control group on all measures. The experimental group achieved greater dorsiflexion , plantarflexion, inversion, muscle strength and vertical jump height as well as a significantly faster TUG time (lower is better) compared to the control group. In all cases the direction of improvement favored the experimental group .

Discussion

The results indicate that the 12-week hydrotherapy-based rehabilitation program was effective in improving ankle joint range of motion , muscle strength , balance and functional capacity in athletes with partial lateral ankle ligament tears . These findings underscore the value of aquatic therapy as an effective tool in sports injury rehabilitation . The significant improvements observed in the experimental group are attributed to the carefully designed rehabilitation protocol which included specific stretching and strengthening exercises in water . Aquatic exercises can enhance joint flexibility, particularly through the buoyancy and resistance properties of water while minimizing joint stress (Kisner & Colby, 2017; Wang et al., 2007) .

In the context of our program the participants' ankle flexibility improved notably due to dedicated stretching exercises especially those performed in water. Similarly muscle strength around the ankle increased significantly as a result of the progressive resistance training in the aquatic environment . These positive outcomes are consistent with previous

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research . Dimitrakopoulou et al. (2024) reported that adding water-based exercises to a traditional rehabilitation program significantly shortened the time to return to pre-injury performance levels in athletes following hip arthroscopy and resulted in substantial improvements in pain and overall satisfaction .

Ankle injuries and associated pain directly affect movement leading to muscle weakness around the joint and hindering athletic performance . Doub et al. (2023) emphasized that joints require continuous movement and a wide range of motion to maintain functional mobility . Aquatic therapy provides a low-impact environment that facilitates continuous joint movement without extra stress, thereby improving joint flexibility more rapidly compared to conventional therapy (Wang et al., 2007) . Wang and colleagues found that after a 12-week aquatic exercise program joint flexibility was significantly improved. the resistance provided by water contributes to increasing muscle strength by offering progressive loading of the muscles (Wang et al., 2007) . Norkin and White (2016) also noted that enhanced muscle strength around joints (such as the knee and ankle) serves a protective role in preventing re-injury .

Analysis of Table 3 shows that post-intervention means were higher for the experimental group across all variables . This indicates that the proposed hydrotherapy-based program facilitated more effective recovery of ankle function . The improved results for the experimental group can be attributed to the combined effect of water exercises and land-based exercises in the rehabilitation program . Consistent physical training increases the nervous system's efficiency in sending signals for muscle contraction, thereby improving strength and endurance (Watanabe et al., 2020). The structured progression of exercises controlled repetitions, and inclusion of hydrotherapy as the primary modality led to the significant improvements observed in the experimental group's post-test scores compared to the control group .

It should be noted that this does not imply that traditional rehabilitation methods are ineffective. Rather it highlights that modern, comprehensive programs can accelerate recovery time a competitive advantage in sports medicine where teams strive to return injured players to play as quickly as possible. Modern rehabilitation programs can complement , rather than replace , traditional approaches , ultimately achieving faster functional recovery .

Conclusions

The hydrotherapy-based rehabilitation program had a positive impact on accelerating the healing process as evidenced by the restoration of normal range of motion and muscle strength in the experimental group . The test results showed significant improvements in the muscle strength of the ankle joint attributable to the program's effects .

Recommendations

It is recommended to adopt the specialized hydrotherapy-based rehabilitation program for treating ankle injuries in athletes . Further research should be conducted on the effects of aquatic therapy on different types of sports injuries and on developing more specific and effective rehabilitation programs. Additionally injured athletes should be

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encouraged to perform complementary home-based exercises to ensure continuous improvement and maintenance of the gains achieved in the rehabilitation center .

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Special Exercises Using the Blazepod Training Device and Their Effect on Motor Response Speed, Help and Recover Defense among Under-18 Basketball Players

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Abstract

The importance of this research depend on introducing a modern and interactive technological tool that improve the efficiency of the training process and offers immediate feedback to the player. This transition in training from the traditional model to one according to intelligent visual and kinetic stimulation thereby improving tactical decision-making. This interactive technology develops motor response speed by immersing the player in a game-like environment which in turn impacts complex defensive skills particularly the Help and Rotate/Recover skills. The research objectives to achieve this by developing specific exercises using the Blazepod training device and identifying the impact of these exercises on developing motor response speed and the performance level of the Help and Rotate/Recover defensive skills in basketball players under 18 years of age. The researchers used an experimental approach with a single experimental group design and two pre-tests. The sample was chosen purposively and consisted of (12) young players from the Dijlah Sports Club with a mean age of (17.14) years and a standard deviation of (±1.855). The mean height was [missing information]. (180.135 cm) with a standard deviation of (± 3.215) and a mean body mass of (78.211 kg) with a standard deviation of (± 3.763). After pre-testing a two-month training program was implemented with the sample three days a week. Post-testing was then carried out and the researchers concluded that the specialized exercises developed by the researchers using the Blazepod training device were more effective than traditional coach-prepared exercises in developing motor response speed and defensive support and coverage skills among young basketball players. This is evident from the difference in the calculated means.

Keywords: Blazepod training device, motor response speed, support and defensive coverage.

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Introduction

The significance of this research lies in introducing modern and interactive technological tools, such as the Blazepod device into the local training environment. This technology develops the efficiency of the training process, raises the level of competitiveness, increases player motivation also provides immediate feedback This shifts training from a traditional approach to one based on intelligent visual and kinetic stimulation thereby improving tactical decision-making. As Diaa (2025) explains "This interactive technology develops the speed of motor response which is important for most defensive skills as it immerses the player in a game-like environment thus optimizing complex defensive skills." Especially this implements to the "Help" and "Rotate/Recover" skills of basketball players under 18 years old the age group where the concepts of collective defense and tactical discipline are most improved.

The principal objective of using this modern training tool is to transform training from a traditional method depended on observation and experience to a scientific method based on measurement, analysis and data-driven decision-making.

The study goals to develop specific exercises using the Blazepod training device and to determine the effect of these exercises on improving motor response speed and performance levels. The skill of assisting and defensive coverage in basketball players under 18 years of age has been the subject of numerous studies including those by Mahdi (2023), Hamad (2023), Muhammad (2021), Al-Ta'i (2015), and Muhammad A. (2008) which have explored this aspect and connected to variables across different sample sizes. However, these studies have not addressed the specific problem this age group needs to solve.

Through observation and tracking of training sessions and matches for the under-18 category and drawing on their academic and technical expertise, the researchers observed a clear weakness or delay in the timing of defensive interventions (providing assistance to teammates) and quick defensive coverage when the ball is passed. This leads to wide gaps that opponents can easily exploit.

The researchers attribute this deficiency to the prevailing reliance on traditional training methods that absences the element of surprise and varied visual stimulation.

They note that assisting and defensive coverage movements are trained as predetermined predictable motion paths, thus depriving players of the ability to react spontaneously. “Swift and quick when faced with changing situations in actual matches” (Mohammed, 2026). From here the research problem crystallized in an attempt to solve this gap by introducing special exercises using the (Blazepod) device to find out the extent of the effect of this technology on improving the speed of motor response and the direct reflection of this on the accuracy and speed of executing the skills of assistance and defensive coverage among basketball players under (18) years of age.

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Methodology

The researchers used the experimental method with a single experimental group design and pre- and post-tests as it was suitable for the research problem. The sample was chosen purposively and it included of (12) players from the Dijlah Sports Club young players under the age of 18, participating in the Iraqi League for the sports season (2025-2026) in order to provide the sample and make it easy to control and because the sample was committed to daily training in addition to the availability of the hall and equipment. The researchers performed homogeneity for the sample by extracting the skewness coefficient as shown in Table (1).

Table1.Shows the variables, unit of measurement, arithmetic means, median, standard deviation, and skewness coefficient for homogeneity of the research sample.

variables	unit of measurement	arithmetic means	standard deviation	skewness coefficient
Age	Year	17.14	1.855	0.903
Training age	Year	5.813	1.472	0.825
Mass	Kg	78.211	3.763	0.781
Hight	Cm	180.135	3.215	0.773

The sample is considered homogeneous if the skewness coefficient does not exceed (±1).

Research Equipment and Tools:

A regulation basketball court, (12) regulation basketballs, (2) timers, (1) HP laptop, (2) Fox whistles, (20) meters of fabric measuring tape, (4) colored tape strips, (12) colored cones, (12) markers Harith's system for measuring motor response speed with visual stimuli and the Blazepod training device as shown in Figure (1).



Figure1. Shows the (Blazepod) training device

Tests:

1. Harith Test for Measuring Motor Response Time (Mohammed H., 2021, p. 56):

❖ Test Objective: To measure motor response speed.

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❖ Required Equipment: Harith Motor Response Time Measurement Device and an obstacle-free area of at least (4 x 4) meters.

❖ Device Description: The device included of four illuminated poles, each (1) meter high. A light sensor is located at the top of each pole. The sensor calculates the time of each attempt when the player touches the pole. The poles are connected by electrical wires to a control unit, which is a plastic box measuring (30 x 20) centimeter. This box contains electronic circuits that calculate the motor response time and display it on an electronic screen (10 x 3) centimeter mounted on the box's surface. The screen displays the time of the eight motor response attempts.

❖ **Test Procedure and Recording:**

- The device begins by illuminating the four markers as a readiness signal for the player being tested. Then all the marker lights turn off concurrently.
- When the subject stands on the starting line the device automatically detects their presence using an infrared sensor. From this point one of the light markers is randomly activated and a timer begins to run.
- The subject then starts running at maximum speed to touch the sensor above the marker to turn off the light. The device displays the time of the seek to which represents the time between the light turning on and off—that is from the moment the subject stands on the starting line and the marker lights up until the moment the sensor above the marker is touched.

- The subject performs eight (8) attempts.

- The motor response time for each subject is calculated by collected the eight attempts.

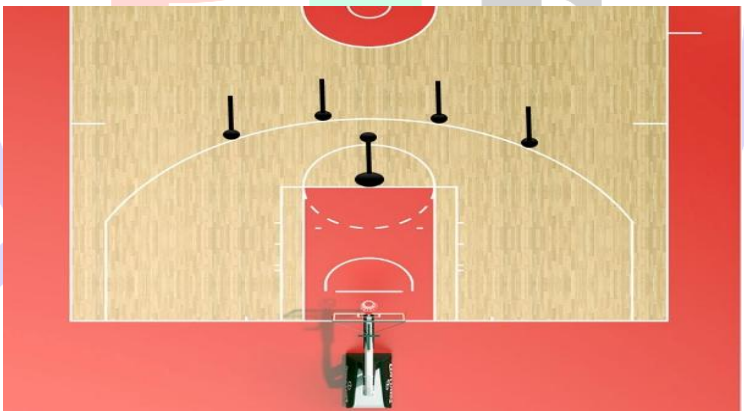


Figure2. Shows the Harith Test for Measuring Motor Response Time

2. Assistance and Cover Test (Hussein, 2012, p. 108):

❖ Test Objective: To measure the speed of assisting and covering basketball players.

❖ Equipment Used: Adhesive tape, leather measuring tape (20m), four markers, electronic timer, whistle and scoring paper and pens.

❖ Test Procedure: Five markers are distributed as follows: Mark 1 is the basket on the floor and Marks 3 and 5 are to the right and left of Mark 1, each 5m away. Marks 2 and 4 are along the free-throw line, facing Marks 3 and 5, as shown in Figure 3.

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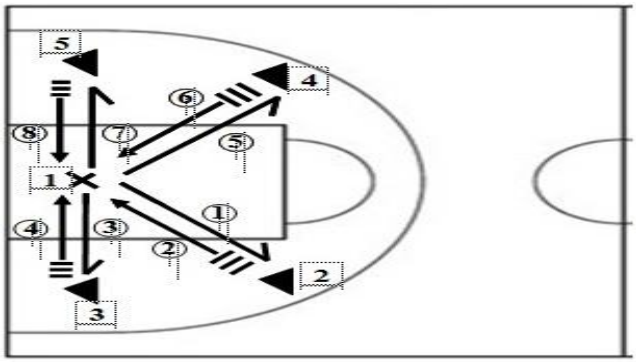


Figure3. Shows the defensive assistance and coverage test

❖ Performance description:

The defending player stands on the first marker, and upon hearing the starting signal via the whistle, the player performs the defending player's movement towards the second marker (marker 1) and touches the marker with the right arm then runs back to the first marker then performs the defending player's movement towards the third marker (marker 2) and touches the marker with the right arm and returns to the first marker then does the same procedure from the other side as shown in the figure in eight steps.

❖ **Test requirements:**

- Perform the test steps quickly.
- Bend your knees when performing the defensive player's movement while raising your arms at least 90 degrees between the upper arm and the torso.
- Only one attempt.

❖ Test management:

- Timer: Gives a start and end signal via a whistle with a timer.
- Recorder: Calls out names and notes performance while recording the test time.

❖ Scoring: The time taken by the player to perform the test with its eight steps is recorded according on the start and end whistles.

Exploratory experiment:

The researchers carried out a preliminary study to confirm several points and information that are necessary when conducting the main research experiment. Therefore the researcher conducted his exploratory experiment on (5) players from Al-Adhamiya Club in the indoor hall of Al-Adhamiya Sports Club on Saturday, 07/02/2026 at four o'clock in the afternoon. The researcher objectives from this experiment to reach the following:

Make sure about the safety and validity of the tools used in carrying out the tests.

Knowing how long each test takes.

Knowing how well the team understands the details of the tests and how to implement them as well as how to record the test findings.

_ Ensuring the suitability of the tests for the sample level and the extent of their understanding and response to them.

Field research procedures:

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Pre-tests:

The researchers conducted the pre-tests for the research sample in the indoor hall of the Tigris Sports Club on Thursday, February 12, 2026 at 4:00 PM.

Exercises used in the research:

The researchers improved special exercises on the (Blazepod) device to enhance the speed of motor response, assistance and defensive coverage with basketball for the research sample. The researchers took into account all the scientific foundations and principles during this phase as follows:

- The training period lasted eight weeks.
- Total number of training units (24 training units).
- Number of weekly training units (3 training units).
- Weekly training days (Saturday, Monday, Wednesday).
- The duration of the special exercises in one training unit is (35-60) minutes within the main section.
- The high-intensity interval training method was used.
- The intensity used for the exercises (75-100%).
- The intensity was determined based on the pulse.
- The wave load was 1:3 (three weeks of increased intensity and one week of decreased intensity for the purpose of adaptation).
- The exercises were started on Saturday, 14/02/2026.
- The exercises were completed on Thursday, 08/04/2026.

Post-tests:

The researchers conducted the post-tests for the research sample in the indoor hall of the Tigris Sports Club on Saturday, April 11, 2026, at 4:00 PM, in the identical manner and under the same conditions as the pre-test conducted by the researcher.

Statistical methods:

The statistical package (SPSS) was used which is:

Percentage, median, arithmetic mean, standard deviation, skewness coefficient, simple correlation coefficient (Pearson's) t-law for correlated samples.

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Results:

Presentation and discussion of the research test result for the experimental group between the pre-test and post-test:

Table2. Shows the arithmetic means and standard deviations for the experimental group between the pre-test and post-test in motor response speed and the assistance and defensive cover test

Test	unit of measurement	post-test		pre-test	
		M	Sd	M	Sd
Harith Motor Response Speed Test	Second	**13.403**	**1.542**	**11.501**	**0.758**
Assistance and Defensive Cover Test	Second	**17.307**	**2.331**	**14.238**	**0.973**

Table3. Shows the difference in arithmetic means, standard deviation, calculated t-value, and significance of the differences between the results of the pre-test and post-test in motor response speed and the assistance and cover test for the experimental group.

Test	unit of measurement	D	E s d	calculated t-value	Error level	Significance
Harith Motor Response Speed Test	Second	**1.902**	**0.155**	**12.270**	**0.000**	Significant
Assistance and Defensive Cover Test	Second	**3.069**	**0.317**	**9.681**	**0.000**	Significant

* DF (12-1=11). Significant at the significance level of (0.05) if the error level is less than (0.05).

Discussion:

Tables (2 and 3) show significant differences between the pre-test and post-test in motor response speed and the defensive assistance and coverage test favoring the post-test.

The researchers feature this to the effectiveness of their designed exercises which were according to sound and standardized scientific principles regarding intensity volume and rest. These exercises conducted over two months, effectively and significantly improved motor response speed using the Blazepod device. Motor response is connected to reaction time and the player's movement time in defensive maneuvers—the time needed to finish a movement, encompassing anticipation, reaction and movement times (W, 1990, p. 202).

This is vital for basketball players in most individual and team defensive skills which are tailored to the nature of the situations basketball players face from the opposing team's offensive play to their rapid response to changes in the offensive situation (Sabbah, 2020).

The researchers increased the obstacles of the exercises as the training sessions progressed by adding more units. The player must perform the greatest number of motor

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responses without being aware where the light is working so that he is fully prepared to defend assist and cover during the match for the opponent's offensive situations.

This is what demand the player during the exercises to increase the speed of performance by developing the speed of response. "Training at different speeds contributes to developing the speed of response" (Alawi, 1998, page 170).

The researchers took into account when giving motor response speed exercises that they should be at the beginning of the training session because the nervous and muscular system is at rest and therefore the exercises are more effective. "The motor response to stimuli is complete when the nervous and muscular system is at rest and it is not permissible to tire it before training on fast movements" (Nassif, 1980, page 58).

As for the results of the defensive assistance and coverage test the researchers attribute this development to the effectiveness of the defensive exercises they prepared on the machine which were chosen in a manner similar to the offensive play situations of the opposing teams. This is in addition to the development of the speed of motor response and the connect between it and the movements of the defending player and the diverse play situations in terms of assistance, coverage and stopping shooting from various areas.

The speed of the defensive player's motor performance which is represented by the speed of motor response and transition is an significance element in basketball as it is related to the result and time of performance and indicates the player's ability to perform a specific movement or set of movements in the shortest possible time.

This verifies from the strong relationship and great correlation between the speed of motor response and defense based on the change in the positions of the player and the attacking team and the speed of the defender's response to this change to reach the best performance and result. Moreover "the variety of exercises and their progression from easy to difficult in terms of the choose intensity and the method of increasing this intensity and its appropriate sizes as well as the suitable rest given to the players whether after each repetition or between sets all of this brought about the development in defensive skills" (Mohammed H., 2026).

Particular drills are the coach's means of implementing and mastering defensive skills. This demands the coach to "create and develop diverse drill combinations that incorporate elements of excitement and suspense basides to physical conditioning to aviod boredom among the players" (Majed, 2026). This necessitates a gradual progression from easy to difficult drills modifying repetitions, intensity, and rest periods based on individual differences. Furthermore it requires "the player to perform these skills with mastery and completeness executing them correctly under any match conditions" (Hassan, 2000, p. 25).

The selection of drills should be based on the movement patterns of the skills (focusing on the working muscles) and the drills should be varied and similar to different game situations. All of this gives the player chance to confront the changing game situations that occur in competition. This is what the researcher reached through his drills using the Blazepod device which provides different signals to the player to perform variety defensive movements contingent on the type and location of lighting to adapt to the changing nature of the game.

The goal of training in basic defensive skills is to The diversity of its options and positions "that the success of the player's skill performance depends on the degree of mastery of motor skills, no matter how the circumstances change which leads to the player reaching a high degree of performance mechanism and effectiveness so that the inevitable

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result is the execution of the desired goal (Muhammad Kh., 2000, page 37) in addition to the quality of exercises prepared by the researchers worked to develop all the muscles working on skill performance through continuous repetition of defensive skills in terms of leg movement assistance, coverage and stopping shooting from different areas, and this requires continuous movement and alertness from the player and thus improves response speed, the physical aspect and coordination between vision and foot movements" that "the exercises inevitably lead to an improvement in neuromuscular coordination and the adequacy of the working muscles in developing their performance capabilities" (Al-Harhouri, 1993, page 101).

Conclusions:

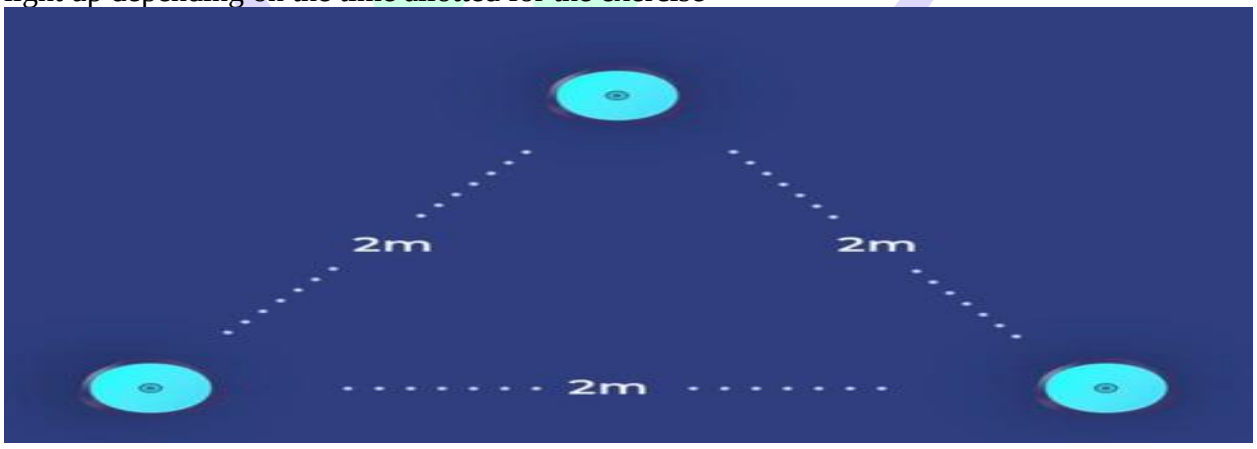
• The researchers' specially designed exercises using the BlazeRod training device were more effective than traditional exercises prepared by the coach in improving motor reaction speed in young basketball players as evidenced by the difference in the calculated averages.
• The researchers' specially designed exercises using the Bazeod training device were more effective than traditional exercises prepared by the coach in developing assisting and defensive covering skills in young basketball players as evidenced by the distinction in the calculated averages.
• The researchers' specially designed exercises using the BazeDod training device were more effective than traditional exercises prepared by the coach in developing neuromuscular coordination in young basketball players as evidenced by the difference in the calculated averages throughout the period.

Appendixes:

Appendix (1)

Exercises used in the study

Ex 1 One player performs the exercise, and 3 pods are located in a triangle with a distance of (2m) between them. The player performs the exercise by performing a side-sliding movement and turning off the light emitted from the pod without knowing which pod will light up depending on the time allotted for the exercise



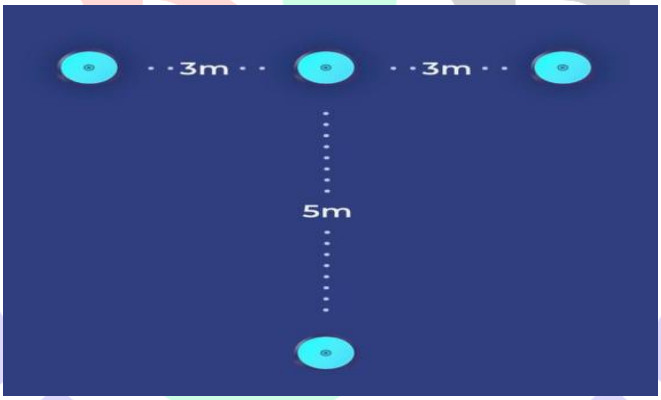
Exercises (2) One player performs the exercise and 4 pods are placed in a square with a distance between them (4m). The player performs the exercise by running to the sides continuously as in assisting and covering in defense and turning off the light emitted from

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the pod without knowing which pod will light up according to the time allotted for the exercise.

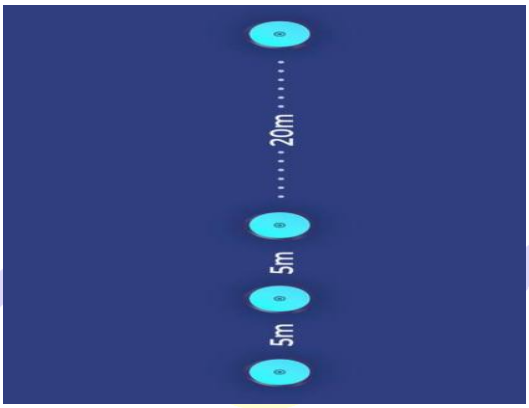


Exercises (3) One player performs the exercise. Four pods are placed in a T-shape with a distance of 3 meters between the side pods and (km) between the front pods. The player performs the exercise by continuously sliding sideways and running forwards and backwards, assisting and covering in defense and turning off the light emitted from the pod without knowing which pod will light up all within the allotted time for the exercise



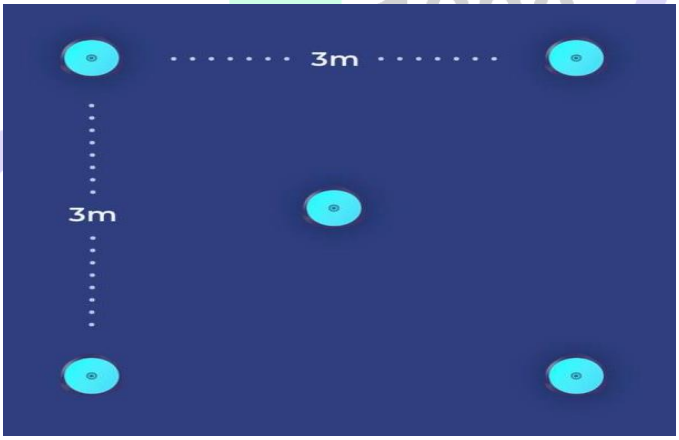
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Exercises (4) One player performs the exercise, and 4 pods are placed in a straight line. The distance between the first and second pods is 4 meters, and between the third and fourth pods is 20 meters. The player performs the exercise by running forwards and backwards continuously, assisting and covering in defense and turning off the light emitted from the pod, without knowing which pod will light up and only during the allotted time for the exercise.



Exercises (5) One player performs the exercise. Four pods are placed in a square with one pod in the center.

The distance between them is 3 meters. The player performs the exercise by sliding sideways and running forwards and backwards continuously as in the example of assisting and covering in defense and turning off the light emitted from the pod without knowing which pod will light up according to the time allotted for the exercise.



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It illustrates the exercises used in the training units

Week and Month: First and Second – First. Number training units.**(6،5،4،3،2،1) :**

*** Exercise Duration: 40 Minutes**

Location: Dijlah Sports Club Indoor Hall

Section	Specified time	Exercise number	Exercise Duration	Sets	Intensity	Rest interval between sets	Rest interval between Exercises	Total performance time
Primary	40m	1	28s	4	%75	2_1m	3_2m	8m
		2	28s	4				8m
		3	28s	4				8m
		4	28s	4				8m
		5	28s	4				8m د

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The Effect of Training Load Regulation Based on Heart Rate Variability Using Wearable Devices on Heart Rate Variability and Estimated Maximal Oxygen Uptake in Weightlifters

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Abstract

This study aimed to test the effectiveness of a training program according to regulated training load using heart rate variability readings (HRV) and estimated VO_2max in weightlifters. The researcher employed an experimental design with two equivalent groups (experimental and control) using pre- and post-tests as this method was appropriate for the nature of the problem and the research objectives. The research population included of weightlifters at the Police Sports Club during the 2026 sports season totaling 12 athletes. The research sample comprised 10 athletes choose purposively and randomly assigned to two equivalent groups: five athletes in the experimental group and five in the control group. Two athletes were used for a pilot study. The research instruments included a Polar H10 device and the Kubios HRV software for measuring heart rate variabilit, as well as a 12-minute Cooper test for estimating VO_2max. The main trial lasted for eight weeks, comprising 24 training sessions. The experimental group adjusted their training load based on heart rate variability readings while the control group continued with the traditional training program. Statistical analysis using SPSS demonstrated improvements in both heart rate variability (from 34.80 to 48.60 ms) and the estimated maximum oxygen consumption (from 45.72 to 52.18 ml/kg/min) in the experimental group demonstrating statistically significant superiority over the control group (38.10 ms and 47.80 ml/kg/min, respectively) in the post-tests. The researcher determined that adjusting training load based on heart rate variability readings using wearable devices is an effective method for developing recovery, functional adaptation and the development of important physiological indicators in weightlifters.

Keywords: Wearable devices, heart rate variability, maximal oxygen consumption, weightlifting.

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Introduction

Training based on daily physiological indicators has become a modern trend in regulating training loads and heart rate variability (HRV) is one of the most commonly used indicators for determining an athlete's daily readiness and directing training load depending on each player's actual recovery status. Wearable devices used to measure HRV vary in terms of sensor technology and measurement accuracy. Some rely on photoelectric sensors (PPGs) integrated into smartwatches such as the Apple Watch. While these are easy to use their accuracy is affected by movement and the device's fit on the wrist which may decrease the accuracy of readings during daily measurements. Others use chest strap ECG devices such as the Polar H10 used in this study which records the heart's electrical signal directly from the chest surface at a high frequency (1000 Hz) giving it higher accuracy in extracting HRV indicators contrasted to devices based on photoelectric technology (Ho et al., 2022; Van Oost et al., 2025).

Heart rate variability (HRV) is a physiological variable that indicates the activity of the autonomic nervous system and the interaction of its sympathetic and parasympathetic branches in regulating heart rate. It is not measured directly but is deduced from a set of mathematical indicators derived from cardiac signal recordings including: SDNN which reflects the total variability; HF and LF which show parasympathetic and sympathetic activity respectively; the LF/HF ratio which indicates the balance between the two branches; and RMSSD which reflects the short-term variability and is connected to parasympathetic activity.

The RMSSD index was adopted in this study over other heart rate variability indices for many methodological reasons. First, RMSSD is less impacted by respiratory rate contrast with frequency indices such as HF and LF, making it more stable and reliable in repeated daily measurements outside the laboratory. Second the objective of the study is to guide the daily training load based on the recovery state and not to conduct a comprehensive and detailed assessment of the autonomic nervous system that demands a full spectral analysis. Third recent scientific literature confirms that RMSSD is the most suitable index for daily field monitoring in athletes due to its ease of calculation, relative stability and gradual development with physical adaptations (Plews et al., 2013; Esco et al., 2025).

The causal mechanism for using heart rate variability in training load regulation depends on a logical sequence that begins with measuring the RMSSD as an indicator of the athlete's autonomic neurological recovery during the rest period before a training session. High values reflect a physiological balance indicating complete recovery and readiness to endure loads while low values indicate the dominance of sympathetic activity and incomplete recovery. These readings are then translated into a daily training decision that involves increasing, maintaining or decreasing the load according to the athlete's actual condition.

This precise regulation is expected to improve the quality of adaptive responses and improve functional performance in the long term. The estimated VO_2max value is a functional indicator whose connection to weightlifting may seem indirect at first glance as this sport relies primarily on the anaerobic system for energy production to execute snatch and clean and jerk movements that need high explosive power over short periods. However increased aerobic efficiency contributes to faster recovery between training sets and increases overall training volume tolerance. Higher oxygen consumption during rest periods

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accelerates the removal of inorganic phosphates and the resynthesis of phosphagen (ATP-PCr), as well as speeding up the elimination of lactate accumulated after consecutive sets. This enables for greater training loads and higher quality training over weeks which give positive impacts neuromuscular adaptations and maximal strength in the long term (Bourdon et al., 2017). Moreover improving the estimated value of maximum oxygen consumption in four-wheel weightlifters is not intended to develop aerobic performance per se but rather it is a means to improve recovery efficiency and increase the capacity to withstand and absorb the total training volume which is the main driver of strength adaptations in this sport.

In reviewing previous studies numerous researchers have explored the use of heart rate variability in training regulation for endurance and ball sports such as Kiviniemi et al. (2007), Schmitt et al. (2015), and Olmos et al. (2024). Some systematic reviews have also demonstrated the potential use of wearable devices for field-based estimation of maximal oxygen consumption (MOOCs) (Železnik Mežan, 2025; Xie et al., 2025). However to the best of our knowledge, no study has investigated the correlation between training load regulation based on daily HRV readings and estimated MOOCs as causally related variables within the context of weightlifting. In other words, it has not been previously examined whether daily training load regulation based on RMSSD can improve estimated MOOCs in weightlifters by enhancing recovery efficiency and increasing training volume tolerance. This demonstrates the knowledge gap that current research seeks to bridge.

The importance of this research lies in its provision of a practical framework for using a particular technique (the Polar H10 chest strap) and a specific physiological indicator (RMSSD) to regulate the daily training load for weightlifters. This method moves away from traditional methods that rely on pre-set training schedules without considering the daily physiological variations among athletes. Furthermore, the research provides coaches with scientific evidence linking load regulation based on neuroendocrine recovery to improved aerobic recovery efficiency as measured by the estimated value of maximum oxygen consumption. This contributes to more accurate training decisions and reduces the likelihood of overexertion. The research also enriches scientific knowledge in the field of sports training physiology and opens avenues for future studies exploring the applications of load regulation according to daily physiological indicators in weightlifting.

Through his assessment of weightlifting training practices the researcher noted that most coaches rely on traditional methods of regulating training loads without fully using modern technologies that provide real-time physiological information about the athlete's condition and response to training. Furthermore neglecting individual differences in recovery and adaptation can lead to decreased training efficiency or excessive fatigue. Therefore the research problem can be summarized in the following question:

Does training guided by wearable devices impact heart rate variability and maximal oxygen consumption in four-wheel weightlifters?

The research objectives to develop a training program based on regulating the training load according to heart rate variability readings using wearable devices for four-wheel weightlifters and to identify the effect of this program on heart rate variability (HRV) and the estimated value of maximum oxygen consumption (VO_2max).

The research suggests that there are statistically significant differences between the pre-test and post-test for the experimental group in the variables of heart rate variability and the approximate value of maximum oxygen consumption in favor of the post-test. In

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addition there are statistically significant differences between the experimental and control groups in the post-tests in favor of the experimental group.

Methodology and Tools

Study Design

The researcher adopted a randomized experimental design with two parallel groups using pre- and post-testing, as it was suitable for the nature of the research problem and its objectives which were to establish the effect of regulating training load according to heart rate variability using wearable devices on heart rate variability and the estimated value of maximum oxygen consumption in weightlifters.

Research Population and Sample

The research population was defined as advanced weightlifters at the Police Sports Club during the 2026 sports season in the middleweight category (81-89 kg). The researcher particularly chose this category because it demonstrates one of the middleweight categories characterized by related homogeneity in the physical and functional characteristics of its athletes. Furthermore, there was a sufficient number of athletes belonging to this category at the club to allow for the application of the randomized experimental design with two parallel groups totaling (12) athletes. The researcher chosen the research sample purposively from the same research population, comprising (10) players representing (83.33%) of the total population. These players were randomly separated into two parallel groups: (5) players for the experimental group and (5) players for the control group. The remaining two players were excluded from the main experiment and used in the pilot study to verify the validity of the tests, equipment and tools before the main experiment was implemented. Before commencing the training program the researcher performed a equivalence test between the two research groups in terms of the study variables to make sure their statistical equivalence and the absence of any significant differences between them as shown in Table 1.

Table1. Equivalence of the two research groups in terms of the study variables

variables	Unit of Measurement	Experimental Group		Control Group		t-value	Significance Value	Significance Level
		M	Sd	M	Sd			
Heart Rate Variability (HRV)	ms	34.80	3.11	35.20	2.94	0.209	0.840	Not significant
Maximum Oxygen Consumption (VO_2max)	ml/kg/min	45.72	2.41	46.10	2.28	0.257	0.804	Not significant

*Significant at a significance level of less than 0.05 and 8 DF

Research Instruments

* Polar H10 records RR intervals at 1000 Hz.
* Kubios HRV app for analyzing heart rate variability data.
* Sports watch compatible with Polar H10.
* Laptop for data processing.
* Legal weightlifting equipment and weights.
* Measuring tape.
* Electronic medical scale.

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* Data entry forms.
* Timer.
* Support team.

Tests used in the research

Heart rate variability (HRV) test (Plews et al., 2013)

Test name: Heart rate variability test using the (RMSSD) index

The purpose of the test: to measure the level of recovery and functional adaptation of the autonomic nervous system.

Tools used: Polar H10 device, Kubios HRV app

Procedure: The player wears a Polar H10 device and sits in a resting position for (5) minutes. Then the cardiac signals are recorded and analyzed using Kubios HRV software to extract the RMSSD value.

Recording Method: The RMSSD value displayed by the Kubios HRV software is recorded in milliseconds (ms) and this value demonstrate the indicator used in the study. Higher values reflect a better level of recovery and autonomic nervous system balance while lower values indicate increased stress or a decrease level of recovery.

Maximum oxygen consumption (VO_2max) test (Cooper, 1968)

Test name: Cooper's 12-minute test.

The purpose of the test: to measure the maximum oxygen consumption.

Equipment used: Running track, stopwatch, measuring tape to determine distance traveled, findings recording form.

Performance procedure: The player stands at the starting line and upon receiving the starting signal, runs or sprints as far as possible within (12) continuous minutes, allowing them to regulate their speed according to their physical ability. When the allotted time expires, the player stops and the total distance covered is recorded in meters.

Recording method: The distance traveled during (12) minutes is recorded in meters then the value of maximum oxygen consumption (VO_2max) is calculated using the following Cooper equation:

VO_2max (ml/kg/min) = (distance traveled in meters - 504.9) ÷ 44.73

The resulting value in (ml/kg/min) is adopted as an indicator of the maximum oxygen consumption.

Exploratory experiment

The researcher conducted the exploratory experiment on (1/3/2026) on two players from the research community and outside the main sample in the closed weightlifting hall of the Police Club, in order to ensure the suitability of the equipment and tools used and to establish the possible obstacles that the researcher may face during the implementation of the tests and the main experiment as well as to determine the time needed to conduct the tests and to ensure the efficiency of the assisting work team.

Pre-test

The researcher conducted the pre-tests for the research sample on (2/3/2026) in the closed weightlifting hall of the Police Club before starting to implement the training program in order to identify the initial levels of the sample members in the two variables of heart rate variability (HRV) and maximum oxygen consumption (VO_2max). The researcher was keen to offer the same conditions for all members of the sample in terms of the place and time of the tests the devices and tools used and the assisting work team as well as standardizing the instructions and measurement procedures in order to ensure the precision of the findings

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and reach the principle of equal opportunities between the members of the experimental and control groups before implementing the primary experiment.

Main Experiment:

After finishing the pre-tests and ensuring the equivalence of the two research groups in the study variables the researcher proceeded to conduct the main experiment in the indoor weightlifting hall of the Police Club. The experiment lasted for eight consecutive weeks from March 3, 2026, to May 3, 2026, with three training sessions per week on Saturdays, Mondays, and Wednesdays, totaling 24 training sessions. Each training session lasted 90 minutes including a 10-minute warm-up, a 70-minute main session and a 10-minute cool-down. Each training session included of three exercises performed in the following order: the first exercise (the main Olympic lift: snatch or clean and jerk) followed by the second exercise (front or back squat) and then the third exercise (a pull-up or assisted exercise). A rest period of 3-5 minutes separated each exercise while the rest periods between sets within each exercise ranged from 2-5 minutes. According to the intensity of the load as shown in Table (2). The speed of performance was determined so that snatch and clean lifts were performed at a maximum explosive speed in order to achieve maximum acceleration of the bar while squat exercises were performed at an explosive contraction speed with a controlled descent phase while pull exercises were performed at an accelerated transition speed that focused on the second phase of the pull.

Table2. Proposed training program for the experimental group with details of the load

Week	Unity	Exercises in order	Intensity (%1RM)	Sets	repetitions	Comfort between sets	Speed of performance
							Week
1	1	Snatch → Back Squat → Pull Snatch	70%	4	6	2–3 minutes	Maximum explosive ← Contractionary explosive ← Accelerated transition
	2	Nerd → Front Squat → Shoulder Press	70%	4	6	2–3 minutes	Maximum explosive ← Contractile explosive ← Controlled
	3	Snatched from the comment ← Pulled net	72%	4	5	2–3 minutes	Extreme explosive → accelerated transition

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	4	snatch ← rear squat	75%	4	5	3 minutes	Maximum explosive force → Contractile explosive force
2	5	Neter → Front Squat	75%	4	5	3 minutes	Maximum explosive force → Contractile explosive force
	6	Snatch from comment ← Pull snatch	77%	4	5	3 minutes	Extreme explosive → accelerated transition
	7	Complete kidnapping	80%	5	4	3–4 minutes	extreme explosive
3	8	Full net	80%	5	4	3–4 minutes	extreme explosive
	9	Back squat ← Pull-up	82%	5	4	3–4 minutes	Explosive systolic → Transitional accelerated
	10	Complete kidnapping	85%	5	3	4 minutes	extreme explosive
4	11	Full net	85%	5	3	4 minutes	extreme explosive
	12	back squat	87%	5	3	4 minutes	explosive contraction
	13	Complete kidnapping	88%	5	3	4 minutes	extreme explosive
	14	Full net	88%	5	3	4 minutes	extreme explosive
5	15	Front squat ← Pull snatch	90%	5	2–3	4 minutes	Explosive systolic → Transitional accelerated
	16	Complete kidnapping	90%	5	2	4–5 minutes	extreme explosive
6	17	Full net	90%	5	2	4–5 minutes	extreme explosive
	18	back squat	92%	5	2	4–5 minutes	explosive contraction

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7	19	Complete kidnapping	85%	4	3	4 minutes	extreme explosive
	20	Full net	85%	4	3	4 minutes	extreme explosive
8	21	Special skill exercises	80%	4	4	3 minutes	extreme explosive
	22	Complete kidnapping	80%	3	3	3 minutes	extreme explosive
	23	Full net	80%	3	3	3 minutes	extreme explosive
	24	Light recovery training session	70%	3	—	—	Light exercise with focus on recovery

Heart Rate Variability (HRV) Measurement Protocol

Heart rate variability was measured daily before the start of each training session according to the following protocol: The athlete arrived at the measurement location 15 minutes before training and sat in a relaxed position on a chair with a straight back in a quiet room at a temperature of 22-24°C. They remained in this position for 5 minutes as an initial stabilization period to minimize the impact of transitions and environmental disturbances on the cardiac signal.

The Polar H10 device was then attached to the chest based on the manufacturer's instructions and the electrical signal of the heart was recorded continuously for 5 minutes at a sampling frequency of 1000 Hz. After recording the data was transferred to a laptop and analyzed using Kubios HRV software (version 10) to calculate the RMSSD value in milliseconds. A personal reference average was calculated for each athlete based on the moving average of the previous 7 days of measurements. This average was updated daily after each new measurement and the daily RMSSD value was contrast with this moving average to inform training decisions.

Training Load Adjustment Mechanism Based on RMSSD Readings

The researcher adopted a specific quantitative mechanism to modify the daily training load based on the relative deviation of the daily RMSSD value from the personal moving average of the last (7) days, according to the criteria shown in Table 3.

Table3. Training Load Adjustment Mechanism Based on Daily Changes in Heart Rate Variability Index (RMSSD)

Daily RMSSD Status Compared to Moving Average	Quantitative Training Decision
5% or more above average	Increase planned intensity by 2.5–5% of 1RM or add one training set to the main exercise
Within ±5% of average	Perform the planned training load as is without any modification
5–10% below average	Reduces total training volume by 10% by decreasing one set per exercise or one repetition per set.

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More than 10% below average	Reduces planned intensity by 5–10% of 1RM and reduces the number of sets to three per exercise, or replaces the training session with a recovery session that includes exercises at 50–60% of 1RM intensity.

Since training load is not described by intensity alone but consists of several key components including intensity, volume, density, repetitions and rest the researcher calculated the Total Training Volume (TCF) as the quantitative indicator reflecting the actual amount of mechanical work performed by the athlete. This was done using the following equation: Total Training **Volume for the Exercise (kg) = Weight Used (kg) × Number of Repetitions × Number of Sets.**

The values for all exercises in a single training session were then summed to acquire the total volume for the session and the volumes of the three sessions were summed to attain the total volume for the training week. This indicator allowed for the determination of the amount of mechanical work performed, comparison of loads between weeks, monitoring of load progression and confirmation of its connection with program objectives. It also facilitated the documentation of load adjustments resulting from the use of HRV data. Table (3) showes the planned total training volume for each week based on the average 1RM weights of the experimental group. It should be observed that the actual volume varied among the athletes according to their weights and the daily adjustments based on RMSSD readings.

Table 4. Total planned weekly training volume for the experimental group

Week	Training Phase	Number of Exercises	Total Repetitions	Average Intensity (%1RM)	Total Planned Volume (kg)*
1	Functional Setup and Adaptation	8	208	70.7	13,920
2	Functional Setup and Adaptation	6	150	75.7	11,760
3	Maximum Strength Development	4	120	80.7	8,820
4	Maximum Strength Development	3	75	85.7	6,150
5	Maximum Strength Development	4	70	88.7	6,230
6	Maximum Strength Development	3	40	90.7	3,960
7	Consolidation and Recovery	4	60	83.3	5,100
8	Consolidation and Recovery	3	30	76.7	2,610
	Total	**35**	**753**	—	**58,550**

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The program weeks included a gradual approach to shaping the training load. Weeks (1-2) were dedicated to the preparation and functional adaptation phase with a high training volume and moderate intensity while weeks (3-6) included the phase of developing maximum strength and raising the efficiency of the nervous and muscular systems with high intensity and a decrease in the overall training volume. As for weeks (7-8) they were dedicated to the phase of consolidating training adaptations, improving recovery and maintaining the level of physical achievement.

As for the members of the control group they continued to employ the traditional training program approved by the team's coach which includes the same exercises, the same order the same intensity and quantities shown in Table (2) without any daily modification, during the same period and with the documentation of the total training volume according to the same equation, while giving attention to unify the number of training units their time and training conditions between the two groups as much as possible.

The researcher took into account the control of all factors that have the impact to the course of the experiment consist of the training location and times the tools and equipment used, the nature of the warm-up, and the performance instructions to ensure that any differences that may appear in the post-test results are due to the effect of the independent variable which is the standardization of the training load according to the readings of the variation in heart rate and not due to other external factors.

Post-test

After the completion of the training program for both the experimental and control groups the researcher conducted post-tests on the research sample on May 4, 2026, in the indoor weightlifting hall of the Police Club. These tests assessed heart rate variability (HRV) and maximum oxygen consumption (VO_2max) to establish the extent of change findings from the main experiment. The researcher ensured that the post-tests were conducted under the same conditions as the pre-tests including location, time, equipment, support staff and testing procedures. This was done to guarantee the objectivity of the results the accuracy of the comparison between the pre- and post-test measurements and to accurately specify the true impact of the training program.

Statistical methods

The research data were statistically processed using the Statistical Package for the Social Sciences (SPSS) and the following statistical methods were used:

- Arithmetic mean
- Standard deviation
- Independent Samples T-Test.
- T-test for correlated samples.
- Percentage

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Results:

Table 4. Results of the Pre- and Post-Tests for the Experimental Group on the Research

Variables	Unit of Measurement	Pre-Test		Post-Test		T-value	Significance Value	Significance Level
		M	SD	M	SD			
Heart Rate Variability (HRV)	milliseconds	34.80	3.11	48.60	3.43	8.954	0.001	Significant
Maximum Oxygen Consumption (VO_2max)	ml/kg/min	45.72	2.41	52.18	2.56	7.826	0.001	Significant

Significant at a significance level of less than 0.05 and 4 DF*

Table 5.Results of the Pre- and Post-Tests for the Control Group In the research variables:

Variables	Unit of Measurement	Pre-Test		Post-Test		T-value	Significance Value	Significance Level
		M	SD	M	SD			
Heart Rate Variability (HRV)	milliseconds	35.20	2.94	38.10	3.02	2.167	0.096	Not Significant
Maximum Oxygen Consumption (VO_2max)	ml/kg/min	46.10	2.28	47.80	2.31	2.014	0.114	Not Significant

Significant at a significance level of less than 0.05 and 4 DF*

Table 6. Results of the post-tests between the experimental and control groups in the variables Research

Variables	Unit of Measurement	experimental groups		control groups		T-value	Significance Value	Significance Level
		M	SD	M	SD			
Heart Rate Variability (HRV)	milliseconds	48.60	3.43	38.10	3.02	5.156	0.001	Significant
Maximum Oxygen Consumption (VO_2max)	ml/kg/min	52.18	2.56	47.80	2.31	2.840	0.022	Significant

Significant at a significance level of less than 0.05 and 8 DF*

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Discussion:

The current discussion focuses on trying to explain the physiological mechanisms underlying the superiority shown by the experimental group in the two study variables surpassing simply describing the apparent results by constructing an analytical framework that links the experimental intervention (regulating the training load) with the noticed adaptive responses.

Regarding the development in heart rate variability (with RMSSD values increasing from 34.80 to 48.60 milliseconds), this improvement cannot be explained as a direct result of the wearable devices, but rather as a consequence of training decisions based on data from these devices. The rise in RMSSD values physiologically reflects an enhancement of parasympathetic nervous system control (vagal tone) and a relative inhibition of sympathetic activity at rest. This autonomic nervous system shift translates into a significant improvement in recovery efficiency, giving the athlete the physiological capacity to absorb and execute larger and higher-intensity training loads without falling into the trap of cumulative fatigue which ultimately leads to improved physiological performance and neuromuscular adaptation. Kiviniemi et al. (2007) indicated that training programs that modify the load according to daily fluctuations in the autonomic nervous system allow the body to respond to the load without disrupting homeostasis, creating an ideal internal environment for improved neuro cardio graphic indicators. Schmitt et al. also demonstrated this. (2015) Relying on HRV indicators allows for determining the optimal training dose that achieves maximum adaptive advantage without exceeding the recovery threshold which is verified by the study of Olmos et al. (2024) which showed that daily monitoring represents the optimal method for improving the efficiency of the autonomic nervous system in athletes.

Regarding the statistically significant increase in the estimated maximum oxygen consumption (VO2max) of the four athletes in the experimental group this can be understood from an integrative standpoint connecting neurological recovery and training capacity. Thanks to the aforementioned improvement in neurological recovery the athletes in the experimental group were able to tolerate a greater overall training volume and higher performance quality in training sets throughout the weeks of the experiment. This higher mechanical load constitutes a maximal training stimulus that leads to central adaptations (such as increased cardiac output) and peripheral adaptations (such as increased capillary density in working muscles) which manifest as an increase in the estimated VO2max. These interpretations are consistent with Bourdon et al. (2017) suggesting that modern load management systems increase the ceiling for functional adaptations. This approach also connect with the findings of Singh et al. (2018) It is shown that athletes with high levels of HRV have a better ability to withstand intense training loads which positively impacts the

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development of their overall functional abilities including aerobic efficiency.

In contrast the researcher attributes the lack of statistically significant improvement in both variables in the control group to the rigidity of the traditional training method. Applying a fixed-load training schedule ignores the fact that physiological readiness fluctuates daily depending on the body's ability to restore balance. When a high load is applied on a day when parasympathetic activity is low (low RMSSD) a mismatch occurs, transforming the load from a "training stimulus" to a "stress stimulus." This increases the dominance of the sympathetic nervous system and limits cellular repair processes hindering adaptations at both the autonomic nervous and cardiorespiratory levels. These result support Halson's (2014) assertion that the absence of precise physiological monitoring leads to a mismatch between the training dose and the adaptive response thus limiting training effectiveness. Furthermore the role of technique in promoting objectivity is highlighted as noted by Migliaccio et al. (2024) The integration of wearable technology moves training from personal guesswork to decisions according to the objective data, ensuring optimal adaptation.

In conclusion the results of this study demonstrate that regulating the training load based on heart rate variability readings represents an integrated physiological mechanism, starting with improving parasympathetic recovery which in turn gives the athlete a greater margin to tolerate the training volume which stimulates circulatory and respiratory adaptations represented by a higher estimated value of maximum oxygen consumption thus confirming that improving aerobic efficiency in weightlifting is essentially a reflection of improved neurological recovery efficiency.

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Conclusions:

1. Heart rate variability (HRV) measurements suggest a potential improvement in parasympathetic nervous system activity and recovery condition.
2. The training program facilitated to an improvement in the estimated value of maximum oxygen consumption (VO2 max).
3. Using HRV data to regulate training load proved effective contrasted to traditional regulation.
4. The experimental group that used wearable device-guided training to reached better results than the control group that trained using the traditional method.
5. Employing wearable device data to guide and regulate training load demonstrated effectiveness in enhancing the studied variables.

Recommendations:

1. This approach can be considered for training weightlifters provided that further studies are conducted on larger samples to confirm its effectiveness.
2. Heart rate variability (HRV) measurements should be used regularly to regulate training loads and monitor athletes' recovery and training readiness.
3. Weightlifting coaches should be provided with wearable devices and modern physiological data examination software to use in training planning.
4. Conduct similar studies across different age groups and training levels, and in other sports, to verify the effectiveness of this type of training.
5. Carry out future studies investigating the effects of targeted training using HRV on other physiological and biochemical variables such as blood lactate concentration, creatine kinase (CK) levels, cortisol levels, C-reactive protein and markers of inflammation and muscle fatigue.

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Predicting the skill of the high spike from position 6 based on the thinking style of volleyball players aged 16-18 years

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Abstract

The research aimed to identify the relationship between thinking style and the high smash skill from position (6) and to identify the percentage of contribution of thinking style to the performance of this skill as well as to construct an equation to predict the level of performance of the high smash skill from position (6) in terms of thinking style among volleyball players aged (15-16) years. The researcher adopted the descriptive approach with the method of correlational and predictive studies to suit the nature of the research and its objectives. The research sample include of (30) volleyball players aged (15-16) years and they were chosen purposively. To collect the data the researcher used the thinking style scale and the high smash skill test from position (6) after make sure that availability of the scientific conditions for the two instruments in terms of validity, reliability and objectivity. The pilot experiment was carried out on 1/15/2026 on a sample consisting of (6) players from the Industry Club while the main experiment was carried out during the two days of 2/12-13/2026 where the first day was allocated to implementing the high smash skill test from position (6) and the second day to applying the thinking style scale. The data were statistically processed utilizing the SPSS statistical software and suitable statistical methods were used, including the arithmetic mean, standard deviation, skewness coefficient, Pearson correlation coefficient, simple linear regression, coefficient of determination t-test and F-test. The results demonstrated a statistically significant positive correlation between thinking style and the high smash skill from position (6). It also presented that thinking style contributes (58.4%) to explaining the variation in the level of performance of this skill. A linear regression equation was built to predict the level of performance of the high smash skill from position (6) in terms of thinking style. The researcher concluded that the thinking style is one of the important variables related to the level of performance of the high smashing skill from position (6) and that it can be relied upon in predicting the level of skill performance of volleyball players aged (15-16) years. The researcher recommended

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utilizing the prediction equation in sports evaluation and selection processes and paying attention to improving the thinking style through training programs and conducting similar studies on other skills and several age groups.

Keywords: Smashing, Thinking style, Volleyball players.

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Introduction

Volleyball is a team sport that has witnessed significant development in recent years due to scientific advancements in sports training, measurement and evaluation and sports psychology. Achieving athletic success in volleyball relies on the integration of several physical, technical, tactical, and psychological aspects. Offensive skills, particularly the spike, have become important in determining match outcomes. The high spike from position 6 is a modern offensive technique that demands high technical, physical and mental capabilities, enabling the player to make the right decisions and execute the performance efficiently under varying competitive conditions.

Researchers and specialists have paid increasing attention to studying the psychological factors affecting skill performance, most notably thinking styles which play an important role in information processing, decision-making, and adapting to changing situations during play. Given the differences in thinking styles among players, this may be reflected in their performance of various offensive skills. Hence, the need arose to study the possibility of predicting the performance level of the high spike from position (6) according to the thinking style of volleyball players aged (16-18) years. This would contribute to providing scientific indicators to assist coaches in selection, guidance, training and enhancing athletic performance. (Habib, 2003, p. 58).

Volleyball has witnessed significant development in its physical, technical, tactical and psychological aspects. Achieving success now depends on the integration of all these aspects. Offensive skills, especially the high spike from position (6) are among the fundamental skills that directly contribute to deciding match results. This skill demands a high level of physical abilities, motor coordination, perception, and quick decision-making in addition to the player possessing appropriate thinking style that helps him choose the optimal movement solution during performance. (Mufti, 2001, p. 45).

The researcher's field observations through his work and monitoring of age group teams indicate a clear disparity in the level of performance of players in this skill, despite their similarity in age, training experience and physical preparation which indicates the existence of other factors that may affect the quality of performance, most notably the thinking style which is one of the cognitive variables that have the impact on information processing and decision-making during competitive situations.

Although many studies have focused on the physical and skill factors affecting skill performance studies that have addressed the relationship between thinking style and the ability to predict the performance level of the high spike skill from position (6) among volleyball players aged (16-18) years are still limited which leaves a knowledge gap in this field and limits the possibility of benefiting from thinking styles in selection, training and evaluation processes.

Research objectives

1. To explain the relationship between the high smashing skill from position (6) and the thinking style of volleyball players aged (16-18) years.

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2. Identifying the percentage of contribution of thinking style to the performance of the high smashing skill from position (6) among volleyball players aged (16-18) years.
3. Forecasting the performance level of the high smashing skill from position (6) in terms of the thinking style of volleyball players aged (16-18) years.

Research hypotheses:

1. There is a statistically significant correlation between thinking style and high smashing skill from position (6) among volleyball players aged (16-18) years.
2. The thinking style facilitates statistically significantly to explaining the variation in the performance level of the high smashing skill from position (6) among volleyball players aged (16-18) years.
3. The performance level of the high-pressure spike from position (6) can be predicted according to the thinking style of volleyball players aged (16-18) years.

Method and tools:

The researcher implemented the descriptive approach using correlational and predictive studies, as it is suitable for the nature of the research problem and its objectives. This approach aims to reveal the nature of the connotation between thinking style and the performance level of the high spike skill from position (6) as well as to determine the percentage contribution of thinking style to skill performance and to construct an equation to predict the skill performance level among volleyball players aged (15-16) years. (Al-Zaghoul & Al-Zaghoul, 2010, p. 77). The research population was defined as players from the Talent Center affiliated with the Ministry of Youth and Sports/Specialized Schools in Baghdad numbering 40 players. The sample was selected purposively and consisted of high spike players who are proficient in the spike skill from position 6, aged 15-16 years, numbering 30 players, representing 75% of the population. Homogeneity variables were applied to the studied research sample as shown in Table (1).

Table 1. Homology Table for the Research Sample

Variable	Unit of Measurement	Arithmetic Mean	Standard Deviation	Crookedness Coefficient
Chronological Age	Year	15.58	0.49	0.21
Training Age	Year	3.42	0.91	-0.18
Height	Cm	178.64	6.12	0.37
Weight	Kg	69.85	5.87	-0.26

The table shows the homogeneity of the research sample in the variables of chronological age, training age, height and weight as the values of the skewness coefficient ranged between (-0.26) and (0.37) which are within the acceptable range (±1) which indicates that the distribution of the sample is normal and that the sample is homogeneous

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in these variables which allows for carrying out the statistical treatments specific to the research.

Data collection methods:

The researcher used a number of scientific methods to collect the data necessary to reach the research objectives which were as follows:

1. Observation: The researcher depends on direct scientific observation while following the training units and matches of the research sample as well as reviewing scientific sources and previous studies connected to the research variables in order to identify the research obstacles and choose its tools and procedures.

2- Thinking Style Scale: The researcher adopted a thinking style scale appropriate for the age group (15-16) years old in order to identify the thinking style of the research sample members and use its findings in studying the relationship and predicting skill performance.

3- Testing and Measurement: The researcher used the high smashing skill test from Center (6) in order to measure the level of skill performance among the members of the research sample and to acquire the data necessary to achieve the study objectives.

Devices and auxiliary tools

The researcher used a number of devices and equipment to assist in carrying out the research procedures, namely:

1. A personal computer (laptop).
2. Thinking style scale forms.
3. Forms for recording the results of the high smashing test from Center (6).
4. Legal volleyballs.
5. A regulation volleyball court equipped with a regulation net.
6. A measuring tape to identify performance zones.
7. Whistle.
8. Office supplies (paper and pens).
9. A video camera or smartphone to document the tests when needed.

Field research procedures:

To reach the research objectives and answer its hypotheses, the researcher followed a set of organized field procedures. The research variables were identified appropriate measurement tools were selected and then they were applied to the members of the research sample according to well-studied scientific steps to make sure that accurate data could be relied upon in statistical analysis and reaching results.

Identifying approved tests and measures:

The researcher identified two research variables: the high smash skill from position (6) as the dependent variable and the thinking style as the independent variable. To select appropriate tests and measures for these two variables the researcher conducted a

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comprehensive survey of scientific sources, references and current studies related to the research topic. This survey resulted in the adoption of the high smash skill test from position (6) to measure the skill performance level as well as the adoption of the thinking style scale to measure the thinking style of the research sample. To ensure the validity of the test and scale and their suitability for achieving the research objectives the researcher prepared a questionnaire and presented it to a group of (5) experts and specialists in the field of motor learning, measurement, evaluation, sports training and volleyball to give their opinions on the validity of the two tools and their suitability for the research sample. They were adopted after obtaining a suitable percentage of agreement from the experts.

The Qatari crushing multiplication test (Hassanein and Abdel Moneim, 1997, page 206)

- Purpose of the test: To measure the accuracy of the diagonal smashing
- Equipment: 3 volleyballs, a volleyball court and a set of exercises one of which is placed in the corner of the court so that its inner corners are 5 cm away from the side and end line.
- Performance specifications: The player performs the smash from position 4 with the coach passing from position 3 using the strong pass to the diagonal. The player performs 15 smash attempts on the back mat then 15 attempts on the main mat. Correct attempts are counted for every 30 attempts. The dimensions of the mat are 1.5 meters long and 1 meter wide from its edge and are 5 cm away from the side line. The dimensions of the back striped area are 1.5 meters long and 1 meter wide and the front striped area is 2 meters long and 2 meters wide.
- Registration:

(4) points for each correct slam where the ball lands on the mat.
(3) We meet you for every four correct smashes in which the ball falls into the striped area.
(2) points for each correct slam where the ball lands in zone A or B.
(1) point for each correct slam where the ball lands in Zone C.

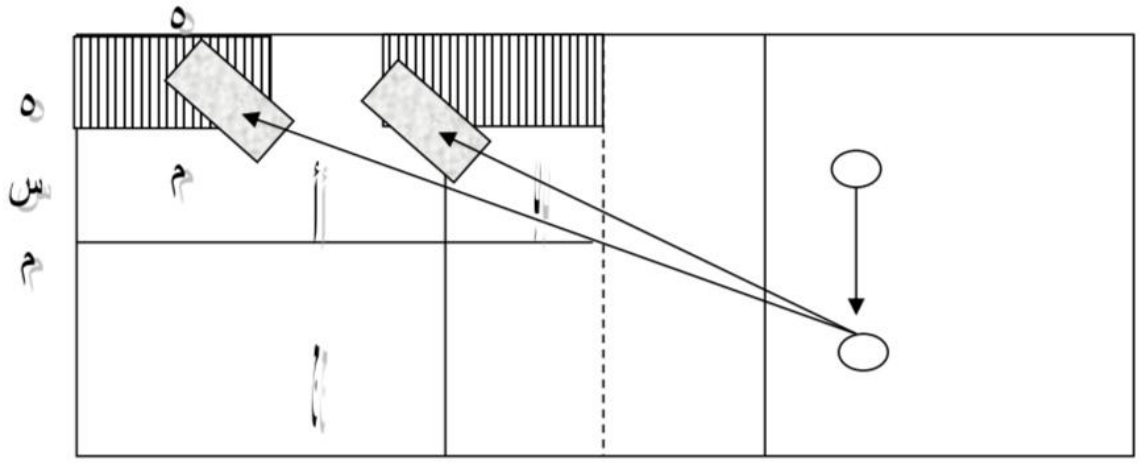


Figure1. shows the spike test in volleyball.

The accuracy test of the diagonal smashing performance demonstrates

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Description of the Flexible Thinking Test (Eidan, 2019)

The flexible thinking scale consists of (30) and the decision method of answering from several alternatives. There is one alternative that is correct and another that is incorrect and the answer alternatives are (1, 0) the correct alternative and the incorrect alternative respectively.

Exploratory experiment

The researcher conducted the exploratory experiment on 1/15/2026 on a sample of (6) players from the Industry Club in the age group (15-16) years old, and they were chosen randomly from outside the main research sample, and the experiment lasted two days.

The first day was dedicated to applying the high smashing skill test from center (6), while the second day was dedicated to applying the thinking style scale, with the aim of ensuring the suitability of the application procedures and the safety of the execution of the tests before starting the main experiment.

The pilot study aimed to achieve the following:

1. Ensure the validity of the skills test and the thinking style scale for application to the sample members.
2. Ensure that the test and scale instructions are clear and that the players understand them.
3. Determine the time demand to administer each test and measure.
4. Identifying the obstacles and difficulties that researchers may face while conducting the tests and working to address them.
5. Ensuring the efficiency of the support team and the mechanism for distributing tasks among them.
6. Ensure the validity of the devices, tools and data registration forms.

The results of the pilot study showed the success of all field procedures, as the organization of the tests was sound, the instructions were clear, the players responded well, and the time allotted for applying both the high smashing skill test from center (6) and the thinking style scale was appropriate, in addition to confirming the validity of the results recording forms and the tools and devices used which encouraged the researchers to proceed with implementing the main experiment according to the specified procedures.

Scientific procedures for tests and measurements used in research

First: Honesty.

The researcher adopted content validity to verify the validity of the research tools. The high smashing skill test from Center (6) and the thinking style scale were presented to a group of experts and specialists in the fields of sports training, measurement and evaluation, motor learning and volleyball numbering (5) experts with the goal of verifying the validity of the two tools in measuring the variables for which they were developed.

After collecting the experts' forms and analyzing them statistically using the chi-square test the results presented that the experts agreed on the validity of the test and the scale as the calculated chi-square value was greater than its tabulated value at a significance level of (0.05) which indicates that they have content validity as shown in Table (2).

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Table2. It shows the content validity results of the tests and measures used in the research.

Variable	Agree	Disagree	Calculated value of (t)	tabulated value (t)	Significance
Thinking Style Scale	5	0	5.00	3.84	Significant
High Smash Test from Center (6)	5	0	5.00	3.84	Significant

Second: Reliability:

To ensure the reliability of the research instruments the researcher applied the test-retest method. The Thinking Style Scale and the High Smash Test from Center (6) were administered to a pilot sample and then re-administered to the same sample after (10) days. After calculating Pearson's correlation coefficient between the results of the two administrations the reliability coefficients were found to be high suggesting the stability of the measurement instruments and their reliability in collecting research data.

Third: Objectivity:

The objectivity of the High Smash Test from Center (6) was verified by using specialized judges to evaluate the players' performance. The correlation coefficient between the judges' scores was then calculated and the results demonstrate a high and statistically significant correlation, confirming the test's high degree of objectivity.

As for the Thinking Style Scale, objectivity calculations are unnecessary because it depends on the responses of the sample members according to standardized instructions and a fixed scoring key.

Table 3. shows the reliability and objectivity coefficients for the tests and scales used in the research.

Variable	Reliability Coefficient	Statistical Significance	Objectivity Coefficient	Statistical Significance
Thinking Style Scale	0.86	0.000	—	—
High Smash Test from Center (6)	0.89	0.000	0.815	0.003

Main experience:

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The main experiment was carried out over two days corresponding to 2/12-2/2026. The first day, 2/12/2026 was dedicated to applying the high smashing skill test from center (6) while the second day, 2/13/2026 was dedicated to applying the thinking style scale. The tests were carried out under uniform conditions for all members of the sample taking into account the provision of the necessary tools and devices the standardization of test instructions and direct supervision by the researcher and the assisting work team to ensure obtaining accurate and objective data that fulfills the research objectives.

Statistical methods:

The researcher used the Statistical Package for the Social Sciences (SPSS) program to process the research data and extract the results and implemented the following statistical methods:

The arithmetic mean, standard deviation, skewness coefficient, Pearson correlation coefficient, independent samples t-test when needed, simple linear regression coefficient, coefficient of determination (R^2) contribution ratio.

Results:

Deriving the equation for predicting the high smash skill from center (6) in terms of thinking style

Finding the correlation between thinking style and high smashing skill from the center

Table 4. It shows the correlation coefficients between thinking style and high smashing skill from center (6).

Variables	Correlation coefficient (r)	Nature of the relationship	Calculated value of (t)	tabulated value (t)	Significance
The high smashing skill from position (6) x thinking style	**0.764**	**Simple positive**	**30.428**	**2.011**	**Significant**

Table (4) shows that the correlation coefficient between thinking style and the high spike skill from position (6) was (0.764) indicating a relatively strong positive correlation. The calculated t-value was (30.428) which is greater than the critical t-value of (2.011) at a significance level of (0.05) demonstrating a significant correlation between the two variables. This findings suggests that the improvement of thinking style among volleyball players aged (16–18) years is associated with improved performance in the high spike skill from position (6) thus supporting the possibility of utilizing thinking style to predict the performance level of this skill.

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Table 5. shows the correlation coefficient and the percentage contribution of the thinking style in predicting the high smashing skill from center (6) are shown.

dependent variable	Correlation coefficient (R)	Nature of the relationship	Contribution ratio (R^2)
The high smashing skill from position (6)	0.764	positive correlation	0.584 (58.4%)

Table (5) shows that the value of the correlation coefficient between thinking style and the high smashing skill from position (6) reached (0.764) which is a positive correlation demonstrating a good relationship between the two variables. The contribution rate reached (0.584) which is equivalent to 58.4% of the variance in the level of performance of the high smashing skill from position (6) that can be explained by the thinking style while the remaining percentage of 41.6% is ascribed to other variables not addressed by the research or to random error. This result confirms the possibility of depending on the thinking style as an explanatory variable in predicting the level of performance of the high smashing skill from position (6).

Table 6. shows The Analysis of variance (ANOVA) of regression to predict the skill of the high spike from the center (6) in relation to the thinking style of volleyball players aged (16–18) years

(Sig.) value F	(Mean Square)	(df)	(Sum of Squares)	The model
0.000 39.312	2299.351	1	2299.351	Inside the squares
	58.595	28	1640.649	Outside the squares
		29	3940.000	Total

At a significance level of 0.05 and two DF (1, 28)

Table (6) shows the results of the regression analysis of variance for predicting the high spike skill from position (6) according to the thinking style of volleyball players aged (16–18) years. The results showed that the coefficient of determination (R^2) was (0.584) which means that the thinking style explains (58.4%) of the variance in the performance level of the high spike skill while the remaining percentage of (41.6%) is attributed to other variables not addressed by the study model such as physical and skill abilities, training experience and psychological factors.

The results also demonstrated that the calculated F-value was 39.312 which is greater than the tabulated F-value of 4.20 at 1 and 28 degrees of freedom and a significance level of 0.05. Moreover the statistical significance level was 0.000 which is less than 0.05. These results

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indicate that the regression model has a high degree of statistical significance and that the relationship between thinking style and high smashing skill is not random but rather a real and reliable relationship for predicting performance.

Table 7. shows the Summary of the regression model for predicting the high spike skill from position (6) in terms of the thinking style of volleyball players aged (16–18) years

Multiple correlation coefficient (R)	Coefficient of determination (R^2)	Adjusted coefficient of determination (Adjusted R^2)	(Std. Error of the Estimate)
0.764	0.584	0.569	7.655

The results showed that the value of the coefficient of determination (R^2) was (0.584) which means that the thinking style explains (58.4%) of the variance in the level of performance of the high smashing skill while the remaining percentage of (41.6%) is attributed to other variables not addressed by the study model such as physical and skill abilities, training experience and psychological factors.

These results indicate that the regression model has a good degree of efficiency in explaining the relationship between the two research variables and can be relied upon to develop an equation to predict the performance level of the high smash skill from position (6) among volleyball players aged (15-16) years.

This result reflects the significant of the mental processes the player employs during performance. The high smash needs quick perception of the game's flow, analysis of the opponent's positions choosing the optimal timing for the jump and determining the direction and power of the shot in relation to the positioning of the block and backcourt defense. Therefore possessing a suitable thinking style contributes to enhancing the quality of decision-making which directly impacts the efficiency of skill execution.

This finding connects with modern trends in sports training science which emphasize that skill performance depends not only on physical and technical preparation but also on mental and cognitive capacities that enable athletes to process information quickly and make sound decisions in a timely manner. It also confirms that integrating cognitive and psychological aspects into training programs contributes to raising the level of skill performance and improving performance prediction in team sports consisting volleyball. Based on the results of the statistical analysis the regression equation is as follows:

Y^=5.481+0.201(X)\hat{Y}=5.481+0.201(X)Y^=5.481+0.201(X)

- Y^\hat{Y}Y^ = Expected score in the high smashing skill from position (6).
- XXX = The player's score on the thinking style scale.
- 5.4815.4815.481 = Constant.
- 0.2010.2010.201 = Regression coefficient.

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Discussion:

The results of Tables (3, 4, 5, 6) demonstrated a statistically significant positive correlation between thinking style and the high smashing skill from position (6). The results also showed that thinking style contributes a good percentage to explaining the variation in the level of performance of this skill as well as the possibility of building a regression equation to predict skill performance in terms of thinking style.

The researcher considers that this result is due to the fact that performing the high smash from position (6) does not depend only on physical and technical abilities but also demands incorporated mental processes that include quickly perceiving the situation analyzing the ball's trajectory, choosing the suitable timing for jumping and determining the direction and power of the shot in accordance with the opponent's position. Therefore the player who possesses a more efficient thinking style is more able to make the right decision and execute the skill performance with a high degree of accuracy and effectiveness. (Martel, 2014, p. 49).

The high smash from position (6) is also one of the most complex offensive skills as it requires a high degree of coordination between sensory perception and movement in addition to the ability to process information received from the surrounding environment in a short time. The thinking style plays a vital role in organizing these processes which helps the player to choose the appropriate movement solution according to the requirements of the competitive situation. (McGown, Fronske, & Moser, 2001, p. 66)

The research results indicate that the high level of thinking among players is reflected positively on the quality of skill performance as the player becomes more able to predict the ball's trajectory, choose the appropriate angle of attack and change the direction of the strike based on the positioning of the blocking wall or defensive players which have the impact on the effectiveness of the smash and the possibility of scoring points.

The regression results also confirm that thinking style is an important variable that can be relied upon in predicting the performance level of the high smash skill from position (6) as it contributed significantly to explaining the variation in skill performance. This indicates that developing thinking styles in players should be an crucial part of training programs by designing training situations that require speed of thinking decision-making, and problem-solving and linking skill training to the mental processes that accompany performance during competition (Williams & Hodges, 2004, p. 120).

The researcher believes that modern volleyball training is no longer limited to developing physical and skill abilities but has become dependent on integrating cognitive and mental aspects with motor performance, due to the impact of this on raising performance efficiency and improving the quality of execution of offensive skills particularly the high smashing skill from position (6) which requires speed of thinking and accuracy in decision-making and execution at the same time.

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Conclusions:

In light of the research objectives and hypotheses, and after presenting, analyzing and discussing the results the researcher achieved the following conclusions:

1. A linear regression equation was developed to predict the performance level of the high smashing skill from position (6) in terms of the thinking style of volleyball players aged (15-16) years.
2. There is a statistically significant positive correlation between thinking style and the performance level of the high smashing skill from position (6).
3. The thinking style contributes significantly to explaining the variation in the performance level of the high smashing skill from position (6) which verifies its importance as one of the variables affecting skill performance.
4. The thinking style can be depended upon as a scientific indicator in predicting the performance level of the high smashing skill from position (6) among volleyball players in this age group.
5. The high level of thinking among players is reflected positively on the efficiency of executing the high smashing skill from position (6) by enhancing the speed of decision-making and the accuracy of choosing skillful solutions during performance.

Recommendations:

In light of the research findings, the researcher recommends the following:

1. Adopting the prediction equation extracted in the research when evaluating and choosing players, especially in the age groups (15-16) years.
2. Giving attention to developing the thinking style of volleyball players by including cognitive exercises and training situations that require speed of thinking and decision-making within the training units.
3. Conducting periodic assessments of the thinking style and high smashing skill level from position (6) and using their results in monitoring the development of players.
4. Employing research findings in preparing training programs that combine the development of mental and skill aspects in a way that facilitates to increase the level of offensive performance of players.
5. Conduct same studies on other offensive and defensive skills and on several age groups and competitive levels to verify the possibility of using the thinking method to predict different aspects of performance in volleyball.

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The Impact of Service Quality on Destination Image among Sports Event Participants: Evidence from the International School Games (Bahrain 2024)

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Abstract

The present study focuses on the effects of service quality on destination image formation for the participants in the International School Games Bahrain 2024. In this regard, a descriptive survey research design was utilized, and data were collected using a valid questionnaire that was distributed to 360 randomly chosen participants who belong to different nationalities and serve various purposes in the event. Results show that all five aspects of service quality are highly satisfied by the participants, and these include tangibility, reliability, responsiveness, assurance, and empathy. In addition, a positive destination image is perceived by them in terms of modernity, development, facilities, safety, and a friendly society. There is a significant effect of service quality on destination image ($p < .001$), where service quality predicts 83.8% of the variance in destination image. The School Games Bahrain 2024 is presented here as an international multi-sport event from which it is possible to see how organizing international events positively impacts the national image of a country and also leads to positive tourism and economic effects, provided there are good service standards during such events. The situation in Bahrain is shown here not as a unique case, but as an exemplary context. The study helps fill the gap both at a global and regional level by stressing the importance of service quality for the perception of the destination and recommending using mixed-methods research in the future.

Keywords: Sport Events, Service Quality, Destination Image, Sports Tourism, Bahrain.

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Introduction

Many nations compete in an effort to host significant sporting events, which would boost their international profile while bringing them various benefits in terms of their culture, economy, and social status. There is a considerable body of literature devoted to the effects of such events on the hosting country and region, which has been the focus of numerous studies (Thomson et al., 2019; Koenigstorfer et al., 2019; Malchrowicz-Mośko & Poczta, 2018). Successful hosting of big sporting events is believed to improve the reputation of the destination in question as a result of increased tourism and business activity that contributes to enhanced international reputation (Rojas-Méndez et al., 2019). This issue may be considered both from the perspective of supply and from the perspective of demand, which is associated with the psychological aspects of participation (Kaplanidou et al., 2013).

In this regard, it is important to note that the idea of service quality during sporting events has received significant scholarly attention because the expectations of participants depend on various factors associated with political, cultural, and social background, which causes different perceptions of services offered to different participants. Service quality assessment in sporting events should be performed according to several parameters, including event organizing, venue features, safety measures, service provider performance, and communication efficacy (Zhao, 2025). Apart from the issue of service quality, another key concept of sport event research is destination image, which consists of three major elements: cognitive, affective, and behavioral (Milovanović et al., 2021). These components define participants' perceptions of an event itself and its destination, which, in its turn, allows making the event a powerful platform for highlighting the characteristics and values of a country to a wide audience (Meier et al., 2021).

Recent studies have established robust connections between service quality, value, satisfaction, and intentions for behavior in the sport and recreation settings (Choi et al., 2018; Le et al., 2025). The significance of evaluating the image of sport events was emphasized by other studies by proving that people develop a cognitive and affective image of events in which they participate (Ocakoğlu et al., 2025). Moreover, some studies proved that the quality of services is a vital component in forming satisfaction, loyalty, and intentions for behavior in the sport and fitness setting (Gücal & Gürbüz, 2024). In this case, sport institutions try to satisfy needs of their beneficiaries through providing high-quality services because effective leadership and organization are necessary for developing positive image of an institution (Alsandi et al., 2025). Thus, these findings prove the relevance of evaluating service quality and destination image in sport event environment.

Despite the vast amount of literature regarding sporting events in the global arena, empirical studies exploring the organizational aspects of such events in the Gulf and Arab societies are few. In the last decade, the Kingdom of Bahrain has taken advantage of being a host to regional and international sporting events to develop the sports tourism sector as well as supporting sports infrastructure through the efforts of the Ministry of Tourism, the Bahrain Olympic Committee, and the sports federations of the country (Sowaid, 2024). However, studies regarding the effects of service quality on the formation of destination image are few in number. Sowaid et al. (2025) call for further systematic and practical research on this subject, especially due to the fast developing Bahraini sport event sector. This study attempts to fill this gap by exploring the perceptions about the level of service

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quality and destination image among beneficiaries of the International School Games (Bahrain 2024).

The study addresses the following research questions:

1. What is the perceived level of service quality among beneficiaries of the International School Games (Bahrain 2024)?
2. What is the perceived destination image among beneficiaries of the International School Games (Bahrain 2024)?
3. Is there a statistically significant relationship between service quality and destination image among beneficiaries of the International School Games (Bahrain 2024)?

Study Design and Methods

Methodology of the Study

A descriptive survey research design was used in the study because this type of research is relevant for the investigation of phenomena existing in reality via the systematic measurement of the participants' perceptions.

Study Population and Sample

The study population included all the beneficiaries and stakeholders in the International School Games (Bahrain 2024), such as coaches, administrators, officials, referees, and media personnel. Based on the data provided by the official source – the Bahrain News Agency (BNA, 2024), the study population was around 5,515 people who represented 80 school federations from 71 countries. The minimum number of respondents that should be surveyed was calculated in accordance with the recommendations of Serdar et al. (2021) taking into account the population of 5,515 people, confidence level 95%, and the margin of error ±5%; thus, the minimum number of the sample should be 359 and round up to 360. Simple random sampling was used for the selection of participants. Table 1 shows the distribution of the study sample.

Table 1. ***Distribution of the primary study sample***

Variable	Level	Frequency	Percentage (%)
Age	Less than 30 years	93	25.8
	From 30 to 40 years	140	38.9
	More than 40 years	127	35.3
	Total	**360**	**%100**
Position	Coach	105	29.2
	Administrator	85	23.6
	Official	68	18.9
	Referee	52	14.4
	Media Personnel	50	13.9
	Total	**360**	**%100**
Identity	Bahraini	73	20.3
	Arab Resident	146	40.6
	Non-Arab Resident	141	39.2
	Total	**360**	**%100**

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Study Instrument and Validity

A quantitative tool in the form of a structured questionnaire was used for collecting data from the study participants concerning service quality and its importance in influencing perceptions of beneficiaries with regards to the International School Games (Bahrain 2024). This questionnaire was designed after conducting a thorough literature review and related studies. Content validity was assessed by a panel of ten experts in sports management, who evaluated the relevance of the items, clarity of wording, and alignment with the study constructs. The experts confirmed the suitability of the instrument, recommending only minor wording modifications, and the item acceptance rates ranged from 90% to 100%, indicating a high level of content validity.

Internal Consistency

Pearson's correlation coefficients were calculated between each item score and its corresponding scale score to assess internal consistency. As shown in Table (2), the correlation coefficients ranged from .704 to .881 for the service quality dimensions and from .716 to .877 for the destination image dimensions. All coefficients were statistically significant at the 0.01 level ($p < .01$), indicating a high level of internal consistency and supporting the construct-related validity of the questionnaire.

Table 2. ***Pearson correlation coefficient between the score of each statement and the axis to which it belongs***

Tangibility	Correlation Coefficient	Reliability	Correlation Coefficient	Responsiveness	Correlation Coefficient
1	.733**	6	.829**	10	.755**
2	.758**	7	.752**	11	.782**
3	.728**	8	.795**	12	.877**
4	.704**	9	.786**	13	.813**
5	.847**			14	.831**
Assurance	**Correlation Coefficient**	**Empathy**	**Correlation Coefficient**		
15	.853**	19	.868**		
16	.881**	20	.768**		
17	.786**	21	.847**		
18	.712**	22	.744**		
Cognitive Image	**Correlation Coefficient**	**Affective Image**	**Correlation Coefficient**	**Social Image**	**Correlation Coefficient**
1	.762**	6	.731**	11	.847**
2	.782**	7	.716**	12	.847**
3	.847**	8	.762**	13	.764**
4	.795**	9	.833**	14	.847**
5	.816**	10	.877**	15	.717**

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Stability of the study tool

To verify the reliability of the instrument, the test-retest method was employed by administering the questionnaire to a pilot sample (n = 27) drawn from outside the main research sample. The same group completed the questionnaire again after a two-week interval. Additionally, Cronbach's alpha was calculated to assess the internal consistency of the instrument, yielding a coefficient of 0.971. This indicates a high level of reliability for the study instrument.

Calculating stability using Cronbach's alpha

Table 3. ***Axes reliability by Cronbach's alpha coefficient***

Dimension	Item Numbers	Cronbach's Alpha
Service Quality Dimensions		
Tangibility	1–5	0.936
Reliability	6–9	0.905
Responsiveness	10–14	0.962
Assurance	15–18	0.918
Empathy	19–22	0.957
Destination Image Dimensions		
Cognitive Image	23–27	0.968
Affective Image	28–32	0.972
Social Image	35–37	0.906
Overall Instrument	**1–37**	**0.971**

Statistical Interpretation Criteria

Arithmetic mean ranges were employed to interpret the levels of the measured variables.

Table 4. *Statistical standard for determining the quality of services and their role in improving the mental image of beneficiaries of the International School Games (Bahrain 2024)*

Degree	Arithmetic mean
low	1.0 - 1.66
Medium	1.67 - 2.33
High	2.34 - 3

Results

This section presents the results reached by this study based on the sample members' responses to the study questions, as follows:

Results related to the answer to the first question: What is the perceived level of service quality among beneficiaries of the International School Games (Bahrain 2024)?

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Table 5. *Arithmetic means in descending order and standard deviations related to the service quality domain (N360)*

number Paragraph	Paragraph	Average Arithmetic*	deviation Standard	Rank	Degree
	Tangibility	2.74	.340		High
1	Bahraini employees are good looking and elegant	2.83	.373	2	High
2	The interior design of sports facilities is characterized by modernity	2.64	.481	4	High
3	Healthy and clean sports fields are available	2.72	.449	3	High
4	The match stadiums have a distinct geographical location	2.61	.637	5	High
5	Bahrain has highly qualified volunteers	2.89	.315	1	High
	Reliability	2.57	.428		High
6	School games services are tied to a specific schedule	2.33	.708	4	Medium
7	School Games staff provide adequate and appropriate information to beneficiaries	2.44	.644	3	High
8	Employees provide a range of services that meet the desires of beneficiaries	2.67	.624	2	High
9	Ease of procedures to obtain services in the Kingdom of Bahrain	2.83	.373	1	High
	Responsiveness	2.63	.332		High
10	School Games organizers provide fast and immediate service to beneficiaries	2.61	.488	4	High
11	The School Games Administration listens to the proposals submitted by the beneficiaries	2.64	.481	3	High
12	The School Games includes a mechanism to evaluate the services provided to beneficiaries	2.39	.637	5	High
13	The School Games administration is interested in resolving problems as quickly as possible	2.75	.434	2	High
14	Volunteers are constantly present at their workplaces	2.78	.416	1	High
	Assurance	2.63	.427		High
15	The School Games Administration works to achieve integrity and transparency in providing services to beneficiaries	2.72	.449	2	High
16	The School Games Administration provides sufficient guarantees and facilities to meet the needs of the beneficiaries of the services provided	2.56	.644	3	High

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17	The stadiums have security and safety factors such as (emergency exits and fire extinguishers)	2.42	.830	4	High
18	There is a list outlining the rights and duties of School Games beneficiaries	2.83	.373	1	High
	Empathy	2.81	.341		High
19	Every beneficiary of the School Games receives adequate attention in the service provided to them	2.81	.396	3	High
20	The workers provide advice to the beneficiaries according to the services provided	2.86	.346	2	High
21	School Games staff are characterized by good manners and respect	2.89	.315	1	High
22	The organizers of the School Games are distinguished by the art of dealing with problems	2.69	.616	4	High
	The tool as a whole	2.68	.337		High

Table 5 indicates that the mean scores for service quality items ranged from 2.33 to 2.89, reflecting medium to high levels of perceived service quality among beneficiaries of the International School Games (Bahrain 2024). Across the five dimensions, the highest-rated aspects related to the presence of highly qualified volunteers (tangibility), ease of service procedures (reliability), continuous availability of volunteers (responsiveness), clarity of beneficiaries' rights and duties (assurance), and staff courtesy and respectful treatment (empathy), collectively indicating a high overall perception of service quality.

Question 2: What is the perceived destination image among beneficiaries of the International School Games (Bahrain 2024)?

Table 6. ***Arithmetic means in descending order and standard deviations related to the destination image domain (N360)***

number Paragraph	Paragraph	Average Arithmetic*	deviation Standard	Rank	Degree
	Cognitive Image	**2.77**	**.310**		**High**
23	The Kingdom of Bahrain has modern civilizational development	2.86	.346	2	High
24	The Kingdom of Bahrain has a thriving economy, advanced technology, and strong internet speed	2.75	.434	3	High
25	The Kingdom of Bahrain is very popular among the delegations participating in the School Games	2.89	.315	1	High
26	public transportation system is excellent in the Kingdom of Bahrain	2.67	.624	5	High

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27	The Kingdom of Bahrain enjoys various tourist attractions	2.69	.461	4	
	Affective Image	**2.72**	**.321**		**High**
28	Through my participation in the tournament, I became a fan of the Kingdom of Bahrain	2.67	.472	4	High
29	Through my participation in the tournament, I loved the Kingdom of Bahrain as a tourist destination	2.64	.481	5	High
30	Through my participation in the tournament, I see that the Kingdom of Bahrain is a country in which one can live	2.69	.461	3	High
31	I felt safe and secure in the Kingdom of Bahrain	2.83	.373	1	High
32	I enjoyed organizing the tournament and the activities that accompany the sporting event	2.78	.416	2	
	Social Image	**2.74**	**.423**		**High**
33	The Bahraini people are friendly and cooperative	2.89	.315	1	High
34	The Bahraini people are committed to traffic safety and adhere to general laws	2.61	.488	5	High
35	The Bahraini people are open to tourism	2.69	.461	3	High
36	The Bahraini people are proud of their country	2.64	.481	4	High
37	The Bahraini people are cultured people, and I did not encounter any linguistic or cultural barriers with the	2.87	.372	2	
	The tool as a whole	**2.74**	**.351**		High

Table 6 shows that the mean scores for destination image items ranged from 2.61 to 2.89, indicating a high overall perception of destination image among beneficiaries of the International School Games (Bahrain 2024). The highest-rated aspects were related to Bahrain's popularity among participating delegations (cognitive image), positive experiences with event organization and accompanying activities (affective image), and perceptions of the host community as friendly and cooperative (social image).

Question 3: Is there a significant relationship between service quality and destination image among beneficiaries of the International School Games (Bahrain 2024)

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Table 7. ***Multiple Linear Analysis to service quality and destination image among beneficiaries of the International School Games (Bahrain 2024)***

Model	Sum of Squares	df	Mean Square	R	R Square	F Value	Sig.
Regression	26.794	5	5.359	.915	.838	366.586	.000
Residual	5.175	354	.015				
Total	31.969	359					

Table (7) presents the results of the multiple linear regression analysis examining the effect of service quality on destination image among beneficiaries of the International School Games (Bahrain 2024). The results indicate a statistically significant effect at the 0.01 level ($p < .001$). The correlation coefficient (R) is .915, indicating a very strong relationship between service quality and destination image. The coefficient of determination (R^2) is .838, suggesting that approximately 83.8% of the variance in destination image is explained by the quality of services. These findings confirm the presence of a strong and statistically significant relationship between service quality and destination image.

Discussion

Service quality is one of the key elements that influence the competitiveness of the sport event industry since it influences the perception of satisfaction, experience, and behavioral intentions of the visitors. As per the results of this research, all the indicators of service quality, including tangibility, reliability, responsiveness, assurance, and empathy, have been evaluated by the participants very positively which means that the International School Games (Bahrain 2024) managed to organize a highly satisfactory experience. These results prove the high level of investment that is made by the country into the development of the human and tangible resources.

The above results confirm earlier studies showing that the dimensions of service quality are significant determinants of satisfaction in the sports and fitness sectors, implying that good service quality has a broad-based effect irrespective of whether the sport is large or small or whether it is conducted in different cultures (Huang & Kim, 2023). Similarly, Berber and Mollaoğulları (2020) indicated that the respondents had high appraisals of service quality concerning the quality of the employees and the quality of the programs, stressing the need for qualified human resource management within an efficient organization structure, as one of the critical aspects for offering quality services in sports events. The results of this study are also in line with those reported by Theodorakis et al. (2015) on the importance of the relationship between participants and service providers in determining service quality. In this case, the high level of responsiveness and empathy indicates that respect for professionalism is essential in service provision.

Alongside other aspects mentioned, material resources, infrastructure development, and institutional factors play an important role in perception of service quality. The high level of satisfaction reported by participants regarding venue quality, accessibility, and transportation system confirms previous findings on the significance of investment in infrastructure as one of the main determinants for making a place attractive and ensuring successful event organization (Boroujerdi et al., 2023; Caraka et al., 2023; Heebkhoksung et al., 2023; Karinda et al., 2024). While improving infrastructure makes operations more efficient, such actions are able to increase the symbolic and emotional aspect of destination. Moreover, in line with existing studies, it was found out that government is one of the major

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players when organizing events internationally due to the provision of legal framework, funding, security, logistics, and promotion (Temnyk, 2017; Weed, 2020). Overall, the discussed data demonstrates how Bahrain's integrated institutional strategy contributes to improved event performance and participant experience.

In relation to destination image, the results of this analysis show strong, positive cognitive, affective, and social images of Bahrain, where participants view Bahrain as a developed, dynamic, technologically advanced, safe, and friendly destination. The results correspond with the findings of previous researches proving that sports events and their host destinations' perceptions positively correlate with people's satisfaction and further willingness to come back to visit the location again (Hallmann & Breuer, 2010; Hautbois et al., 2020). It is notable that the social image of Bahrain, which is defined by hospitality, cooperativeness, openness, and pride of people for their native place, corresponds to the literature on the subject, emphasizing the significance of the interaction between locals and visitors for achieving good outcomes at events (Polcsik & Perényi, 2022; Yao & Schwarz, 2018). This statement was echoed by Vial and Barget (2023) who stated that cultural expression and social integration play important roles in leaving a social legacy from sports events. Finally, the obtained findings are also consistent with Rozhda and Sheresheva (2021) who stated that properly arranged international sports events can increase the visibility of locations and make tourists attracted to visiting the location.

From the results of this research, it can be stated that there is a strong relationship between service quality and destination image which has very high explanatory power ($R^2 = .838$, $p < .001$). This means that when there is perceived high service quality, the evaluation of the host destination will be positive. Such a conclusion has been made based on other researches which emphasize the impact of quality of services and events on perception regarding destinations. For instance, Milovanović et al. (2021) noted that the quality of sport event plays an important role not only for destination image but also affects the behavioral intention of visitors as their evaluation of the organizational and service aspects exceeds the evaluation of the event. In addition, the research carried out by Kusumah and Wahyudin (2024) found that the higher quality of events had a positive effect on tourists' destination image and increased their satisfaction with their visit as well as loyalty to the given destination. In addition, according to the findings obtained by Setyaningtyas et al. (2021), destination image can be linked to such aspects as the quality of events, sports participation, and motivations for travel. Likewise, Sowaid and Al-Salawi (2026) found that the hosting of a major sporting event in Bahrain created positive cognitive, social, and cultural perceptions of it among the participants.

In a similar vein, however, some other studies have taken into consideration the mediating influences in establishing the relationship between service quality and destination image. According to a study conducted by Rahayu et al. (2024), sports events help in improving revisit intentions and ensuring sustainability in tourism by indirectly impacting destination performance through satisfaction and value perceptions, an outcome similar to the one achieved here. Nevertheless, these studies also highlight how the relationship in question may have more dimensions than just service quality and destination image, since other factors might come into play. On the contrary, the current study found that service quality in itself accounts for a considerable amount of the variance in destination image, a result that might be attributed to the nature of newly-formed sports tourism destinations that depend more on their services in creating an image.

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Conclusion

The current study has found out that service quality is an essential factor in the formation of perceptions regarding sports events as well as the overall destination image. High service quality in all aspects at the International School Games Bahrain 2024 indicates the effectiveness of the sports event model, which helps in creating positive associations and attitudes towards the sporting event. Strong correlation between service quality and destination image serves as a theoretical contribution to the fields of sport tourism and event management in the Gulf countries, where there are very few empirically-based studies available.

Furthermore, the results of the research have practical implications for sport event managers, tourism officials, and policymakers. It becomes obvious that high levels of service quality can make significant contributions to the overall destination image. Therefore, consistent investments should be made into staff training, volunteer education, and participant-oriented services. In addition, the use of service quality protocol, performance measurement systems, and digital tools is also necessary.

Moreover, the findings indicate the significance of the quality of infrastructure, venue accessibility, safety and transportation services for the participant experience. Consequently, proper planning and coordination between sport associations, local governments and tourism authorities become critical in order to ensure that sports events are incorporated into larger destination development programs. In this regard, international sport events can be considered as tools for positioning destinations and marketing their tourism potential. The coordination of sports events management and tourism/economic policies of the country will be beneficial for destination reputation building.

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Recommendations and Future Research

Several recommendations can be made based on the results of the study. In terms of practice, it is suggested that the organizers of sport events and other involved parties implement service quality management programs that involve continuous training of employees, implementation of standardized processes, and collection of participants' feedbacks. These steps will improve the quality of services and contribute to increasing their effectiveness, thereby ensuring better experiences of visitors and building a positive image of the destination. It is necessary to give much consideration to the development of volunteers' skills, improvement of communication processes, and using digital technologies in the process of delivering services during large-scale sport events.

In regard to research, there is a need to use longitudinal designs in future studies aimed at analyzing the impact of sport events on the destination image, tourist behavior, and local community. The use of mixed methods can allow researchers to conduct more in-depth analysis and understand the phenomenon better. Comparative studies conducted among different destinations should also be used, especially in the GCC countries. Future research should consider mediating and moderating factors, such as perceived value, satisfaction, and behavioral intentions.

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A Comparative Study of The Level of Psychological Anxiety During The Examination Period Among Students of The Faculty of Physical Education and Sports Sciences

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Abstract

Exam anxiety is common phenomenon among students, natural feeling arises from the stress and psychological pressure associated with exam preparation and high expectations regarding academic performance. Some of scientific studies indicate that the university environment may contain a number of academic and psychological pressures, as the density of some course materials the accumulation of assignments and frequent tests as family and societal expectations and competition among students, all contributes to increased anxiety levels during exam periods. The research problem lies in identifying certain factors that clearly contribute to student anxiety during exam periods, direct impact on academic achievement and students' mental and physical health. Aims of this study to identify gender differences in exam anxiety. Descriptive survey methodology was employed, and the research sample consisted of (100) students fourth-year stage (male and female) from Physical Education and Sports Sciences College, the exam anxiety test was administered electronically via a questionnaire. Results showed a significant difference between genders with females exhibiting higher levels of exam anxiety than males. This research findings recommend raising awareness among teachers and educational specialists about exam anxiety among students, a significant factor negatively impacting academic success, recommends conducting lectures, seminars and workshops led by specialists in psychology and psychiatry to help students reduce anxiety and enhance their ability to cope with exam pressures.

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Keywords: Exam Anxiety, SARSON Scale.

Introduction

Exam anxiety is a common phenomenon among students, it's a natural feeling arising from the tension and psychological pressure associated with exam preparation and the high expectations regarding academic performance. The causes and effects of this anxiety are diverse, encompassing psychological and social pressures placed on the student. Anxiety can be multidimensional: it may serve as a driving force that motivates performance and fosters self-development and capability enhancement, or it may act as an obstacle that hinders concentration and academic achievement. It poses a psychological challenge by affecting a student's ability to comprehend and recall information at the critical moment, potentially leading to results that fall short of expectations despite the effort invested in preparation.

Abu Tabanja (2021), note that sports psychology aims to achieve a set of interconnected goals, seeking to understand and explain human behavior, as well as to identify the causes behind it and the factors influencing it (Abu-Tabanja et al. n.d.). Furthermore, psychology seeks to predict human behavior based on the relationships between various psychological phenomena, thereby enabling the control of behavior—modifying, directing, and improving it toward desirable outcomes. These outcomes include building social relationships, influencing others, managing anger, avoiding anxiety and rebelliousness, and promoting mental health through the diagnosis, treatment, and prevention of psychological disorders.

This is corroborated by Sami (2025), who affirm that human behavior remains a central subject of study in sports psychology (Sami et al. 2025); manifestations of such behavior include psychological anxiety, personality traits, motivation, psychological stress, burnout, sports-related violence, and sports-related aggression. Scientific studies indicate that the university environment entails various academic and psychological stressors—such as heavy course loads, the accumulation of assignments, frequent exams, family and societal expectations, and peer competition—which can contribute to heightened anxiety levels among some students during exam periods. Anxiety levels vary from student to student based on factors such as motivation, self-confidence, academic preparedness, and the ability to cope with stress. This is corroborated by Nkouonlack (2025), who identify depression, anxiety, and stress as major sources of distress for university students (Nkouonlack et al. 2025; Lian & Atiyah, 2024), noting their negative impact on academic achievement as well as psychological and social swell-being.

In this context, Roone (2019) note that the word "exam" triggers varying degrees of anxiety in students, depending on the exam's importance, the subject's difficulty, and the student's level of preparation (Roome & Soan 2019). Subjects perceived as difficult provoke higher levels of anxiety; furthermore, exam anxiety—as a psychological state—can negatively

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affect individuals across various life domains, particularly students facing various examinations.

A Spielberger (1980) study who introduced the Test Anxiety Inventory (TAI). This instrument has been one of the most widely used measures since 1980 in research concerning academic or test anxiety (Kubíková et al. 2018), categorizing anxiety into two primary dimensions: cognitive anxiety and emotional anxiety. This research highlights the primary causes of student anxiety during examinations and its psychological, physical, and academic impacts. It also aims to identify strategies and methods that can help alleviate anxiety and stress while enhancing academic performance. The study is motivated by the significance of this issue and its influence on the quality of education; its primary objective is to offer effective recommendations that assist students in overcoming these pressures to achieve outstanding academic results.

Consequently, the research addresses the factors that significantly contribute to student anxiety during exams—a condition that directly affects academic achievement as well as mental and physical well-being. Understanding this phenomenon facilitates the development of guidance and counseling programs designed to help students reduce exam anxiety, optimize their performance during tests, and foster mental health, thereby striking a balance between academic success and personal well-being.

Methods

This study aimed to identify anxiety levels among students during the examination period and to compare these levels between male and female students. It hypothesized the existence of a statistically significant difference in anxiety levels between male and female students during the examination period. The study employed a descriptive survey method, as it was best suited to the nature of the research. The research population is defined as the aggregate of all subjects under study (Dhari & Abbas, 2026). The population was identified as fourth-year students at the College of Physical Education and Sports Sciences, University of Baghdad, for the 2024/2025 academic year, totaling 408 students. A purposive sample of 120 students (representing 30% of the total population) was selected, comprising 60 males and 60 females.

The Sarason Test-Anxiety Scale was used; this is a questionnaire designed to measure psychological anxiety (specifically test anxiety). Originally developed by Spielberger (1980), the questionnaire consists of 38 items related to test anxiety, as detailed in Appendix 1.

A pilot study was conducted to assess the clarity of the test anxiety scale's instructions and items, to identify any statements that were ambiguous in terms of wording, language, or content for the research sample, and to determine the time required to complete the questionnaire. A pilot study was conducted on a sample of 20 fourth-year students (10 males and 10 females) on Tuesday, April 8, 2025. Paper-based questionnaires were distributed to the selected sample to identify potential issues researchers might face during the main

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experiment and data collection. The pilot study revealed several challenges: the total time required to complete the paper questionnaire ranged from 15 to 20 minutes; many items were left unanswered due to the length of the questionnaire; some questionnaires were damaged by erasing or crossing out answers; and, finally, some respondents selected multiple answers for a single statement, which constitutes an error.

The main experiment involved administering the questionnaire to a sample of 100 fourth-year students from the College of Physical Education and Sports Sciences at the University of Baghdad. The sample consisted of 50 male students (excluding the 10 who participated in the pilot study) and 50 female students (excluding the 10 who participated in the pilot study). The questionnaire was distributed electronically via Google Forms and shared with students through Google Classroom. Before the students began answering the questionnaire online, the data entry process was explained to them directly to facilitate data collection and classification, and to ensure robust results through the platform's algorithmic processing.

Statistical analysis was performed using SPSS (Version 17.10) to process the data; the arithmetic mean, standard deviation, and independent samples t-test were utilized.

Results

Table 1. *Shows the arithmetic means, standard deviations, percentages, and sample trends for the Test Anxiety Scale (Sarason) among students of the College of Physical Education and Sports Sciences, University of Baghdad*

Male Students					
N	**Question**	**Arithmetic mean**	**Standard deviation**	**Percentage**	**Sample trend**
1	I feel annoyed with every question the teacher asks me to make sure I benefit and learn the lesson.	2.44	16.94	61%	Disagree
2	I am worried about whether I will be promoted from my current grade to the next grade at the end of the year.	2.28	26.85	57%	Agree
3	I feel nervous if the teacher asks me to stand up and read aloud.	2.21	14.97	55%	Disagree
4	When the teacher asks me to solve some matters on the board, I hope to myself that he will ask someone else to do that and not from me.	2.58	16.21	65%	Disagree
5	While I sleep, I dream a lot about exams.	2.19	11.73	55%	disagree
6	My heart rate increases when exams date approach.	2.40	14.43	60%	Strongly disagree
7	I feel very anxious when I get ready for bed because I think about how I will do on the exam tomorrow	2.60	21.18	65%	Strongly disagree
8	My writing hand trembles when the teacher asks me to write on the board in front of my class.	2.14	16.21	53%	Disagree

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9	I feel more nervous when the exam date approaches than my fellow students.	2.23	15.06	56%	Disagree
10	When I am at home and think about tomorrow's lessons, I feel afraid that I will give wrong answers.	2.42	14.76	60%	Disagree
11	If I miss school due to illness, I feel that my performance in homework will be lower than that of other students.	2.81	22.63	70%	Agree
12	When I think about the next day's lessons, I worry that my performance in some lessons will not be acceptable.	2.60	18.18	65%	Agree
13	I feel nauseous, trembling, or dizzy when the teacher asks a question to determine how much I learned from the lesson.	2.47	20.81	62%	Disagree
14	I feel confused and stressed if the teacher asks me a question and I answer it wrong.	2.77	26.41	69%	Agree
15	I feel afraid of every situation that involves an exam.	2.37	14.73	59%	Disagree
16	I feel very upset before taking the exam.	2.28	20.22	57%	Disagree
17	After finishing the exam, I feel nervous about my performance in this exam.	2.47	23.33	62%	Agree
18	Sometimes I feel that my performance in the exam I took was bad, no matter how much I studied and prepared for it.	2.49	16.32	62%	Agree
19	I feel that my writing hand is shaking a bit during the exam	2.23	18.55	56%	Disagree
20	I am afraid of failing in my performance if I know that the teacher will give us an exam.	2.56	17.16	64%	Disagree
21	I feel that I forget a lot of information during the exam that I remembered before it started.	3.00	31.54	75%	Agree
22	I wish I did not feel so upset about the exam.	2.72	21.93	68%	Agree
23	I feel anxious if the teacher tells me he wants to give us a test	2.37	15.15	59%	Disagree
24	I feel that I will perform poorly while answering the exam.	2.53	20.02	63%	Disagree
25	Sometimes when I am on my way to school, I am afraid that the teacher will give us a surprise exam.	2.44	14.97	61%	Disagree
26	I feel a severe headache before and during the exam.	2.30	16.56	58%	Disagree
27	My fear of failure hinders my performance and progress on the exam.	2.77	21.27	69%	Disagree
28	I feel anxious when the teacher announces how much time is left until the exam ends.	2.84	31.37	71%	Agree
29	I feel afraid while waiting for the exam question papers to be distributed	2.70	23.18	67%	Strongly disagree
30	I feel anxious during the exam that I will not have enough time to answer.	2.51	21.56	63%	Disagree

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31	I feel anxious while waiting to enter the exam hall.	2.70	23.92	67%	Agree
32	I feel afraid of school because it reminds me of exams.	2.35	19.28	59%	Disagree
33	I feel uncomfortable while students in the yard talk about an upcoming exam.	2.37	17.94	59%	Disagree
34	Sweat secretion increases on my hands or face during the exam.	2.30	18.06	58%	Disagree
35	I feel stressed and confused as I prepare for my daily exam.	2.35	16.48	59%	Disagree
36	I often feel anxious while preparing for the exam the day before it is due.	2.63	24.96	66%	Agree
37	I always feel nervous and confused when preparing for the final exam.	2.67	35.07	67%	Strongly disagree
38	I feel anxious when I listen to the teacher announcing the dates of the upcoming exams.	2.56	15.29	64%	Disagree

Table 2. *Presents the arithmetic means, standard deviations, percentages, and sample trends for the Test Anxiety Scale (Sarason) among female students at the College of Physical Education and Sports Sciences, University of Baghdad*

Female Students					
N	**Question**	**Arithmetic mean**	**Standard deviation**	**Percentage**	**Sample trend**
1	I feel annoyed with every question the teacher asks me to make sure I benefit and learn the lesson.	2.44	16.94	61%	Disagree
2	I am worried about whether I will be promoted from my current grade to the next grade at the end of the year.	2.28	26.85	57%	Agree
3	I feel nervous if the teacher asks me to stand up and read aloud.	2.21	14.97	55%	Disagree
4	When the teacher asks me to solve some matters on the board, I hope to myself that he will ask someone else to do that and not from me.	2.58	16.21	65%	Agree
5	While I sleep, I dream a lot about exams.	2.19	11.73	55%	Strongly disagree
6	My heart rate increases when exams date approach.	2.40	14.43	60%	Agree
7	I feel very anxious when I get ready for bed because I think about how I will do on the exam tomorrow	2.60	21.18	65%	Agree
8	My writing hand trembles when the teacher asks me to write on the board in front of my class.	2.14	16.21	53%	Disagree
9	I feel more nervous when the exam date approaches than my fellow students.	2.23	15.06	56%	Disagree

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10	When I am at home and think about tomorrow's lessons, I feel afraid that I will give wrong answers.	2.42	14.76	60%	Agree
11	If I miss school due to illness, I feel that my performance in homework will be lower than that of other students.	2.81	22.63	70%	Agree
12	When I think about the next day's lessons, I worry that my performance in some lessons will not be acceptable.	2.60	18.18	65%	Agree
13	I feel nauseous, trembling, or dizzy when the teacher asks a question to determine how much I learned from the lesson.	2.47	20.81	62%	Agree
14	I feel confused and stressed if the teacher asks me a question and I answer it wrong.	2.77	26.41	69%	Agree
15	I feel afraid of every situation that involves an exam.	2.37	14.73	59%	Disagree
16	I feel very upset before taking the exam.	2.28	20.22	57%	Disagree
17	After finishing the exam, I feel nervous about my performance in this exam.	2.47	23.33	62%	Agree
18	Sometimes I feel that my performance in the exam I took was bad, no matter how much I studied and prepared for it.	2.49	16.32	62%	Disagree
19	I feel that my writing hand is shaking a bit during the exam	2.23	18.55	56%	Disagree
20	I am afraid of failing in my performance if I know that the teacher will give us an exam.	2.56	17.16	64%	Agree
21	I feel that I forget a lot of information during the exam that I remembered before it started.	3.00	31.54	75%	Agree
22	I wish I did not feel so upset about the exam.	2.72	21.93	68%	Agree
23	I feel anxious if the teacher tells me he wants to give us a test	2.37	15.15	59%	Agree
24	I feel that I will perform poorly while answering the exam.	2.53	20.02	63%	Agree
25	Sometimes when I am on my way to school, I am afraid that the teacher will give us a surprise exam.	2.44	14.97	61%	Disagree
26	I feel a severe headache before and during the exam.	2.30	16.56	58%	Disagree
27	My fear of failure hinders my performance and progress on the exam.	2.77	21.27	69%	Agree
28	I feel anxious when the teacher announces how much time is left until the exam ends.	2.84	31.37	71%	Agree
29	I feel afraid while waiting for the exam question papers to be distributed	2.70	23.18	67%	Agree
30	I feel anxious during the exam that I will not have enough time to answer.	2.51	21.56	63%	Disagree
31	I feel anxious while waiting to enter the exam hall.	2.70	23.92	67%	Agree

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32	I feel afraid of school because it reminds me of exams.	2.35	19.28	59%	Disagree
33	I feel uncomfortable while students in the yard talk about an upcoming exam.	2.37	17.94	59%	Disagree
34	Sweat secretion increases on my hands or face during the exam.	2.30	18.06	58%	Agree
35	I feel stressed and confused as I prepare for my daily exam.	2.35	16.48	59%	Disagree
36	I often feel anxious while preparing for the exam the day before it is due.	2.63	24.96	66%	Agree
37	I always feel nervous and confused when preparing for the final exam.	2.67	35.07	67%	Agree
38	I feel anxious when I listen to the teacher announcing the dates of the upcoming exams.	2.56	15.29	64%	Disagree

Table 3. *Shows the arithmetic mean and standard deviation results for the selected sample of students (males and females) on the Sarason Test Anxiety Scale*

	Gender	Number	Standard Deviation	Arithmetic Mean
Exam Anxiety	Male Students	**50**	**126.3**	**34.1**
	Female Students	**50**	**178.3**	**24.3**

Table 4. *Shows the Levene's test value and the calculated t-value for the two selected samples of students (males and females) on the Sarason Test Anxiety Scale*

	Levene's Test		Independent Samples Test				
Exam Anxiety	**F**	**Sig.**	**Calculated t-value**	**DF**	**Sig. (2-tailed)**	**Std. Error Difference**	**Statistical significance**
	11.488	0.001	8.776	98	0.000	5.927	Significant

At the significance level of 0.05.

Discussion

The results of Table No. (1) of the male students' answers showed that there were a number of statements characterized by high selection rates. We find that the statement No. (21), which states (I feel that I forget a lot of information in the exam that I remembered before it began), came in first place in terms of the selection percentage among the students, as the percentage reached (79%), which indicates that the tendency of the sample members was towards agreeing with this statement. Statement No. (7), which states (I feel very anxious when I prepare for sleep as a result of thinking about what my performance will be in the exam tomorrow), came in second place in terms of the percentage of choice among students,

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as the percentage reached (76%), which indicates that the sample members' tendency was towards strongly agreeing with this statement.

Finally, statement number (37), which states (I always feel nervous and confused when I prepare for the final exam), came in third place in terms of the percentage of choice among students, as the percentage reached (75%), which indicates that the sample members' tendency was towards strongly agreeing with this statement. This is what is confirmed by Liu (2024) that anxiety is an emotional state that the student experiences, including severe and high-level anxiety (Liu & Wang 2024), which hinders the students in taking their exams, as it generates inappropriate responses within the examination situation, such as preoccupation with that study, failure, success, or other external preoccupations, and this preoccupation interferes with the situation required by the student and may be the reason for the appearance of anxiety in them in the theoretical exam.

While the results of Table No. (2) for the responses of female students showed that there were a number of statements characterized by high selection rates, we find that the statement No. (21), which states (I feel that I am forgetting a lot of information in the exam that I remembered before it began) came in first place in terms of the selection percentage among the students, as the percentage reached (75%), which indicates that the tendency of the sample members was towards agreeing with this statement, and it is similar to the choice of male students in this particular statement. Statement No. (28), which states (I feel anxious when the teacher announces how much time remains until the end of the exam), came in second place in terms of the percentage of choice among students, as the percentage reached (71%), which indicates that the sample members' tendency was towards agreeing with this statement.

Finally, statement number (11), which states (If I am absent from school as a result of illness, I feel that my performance of school duties will be lower than other students), came in third place in terms of the percentage of choice among students, as the percentage reached (70%), which indicates that the sample members' tendency was towards agreeing with this statement. From these results in Tables No. (1) and Table No. (2), it is clear that differences in gender play an important role in determining the direction of the sample, as well as in the percentages of similarity in choosing to answer the statements of the scale used.

This is confirmed where test anxiety refers to the feeling of excessive anxiety, fear, and physical tension that individuals may experience before, during, or after taking a test. It is a common phenomenon among students, and can have a significant impact on their academic performance and psychological well-being (Symes & Putwain 2020). This is what Rani 2025 indicated Exam anxiety is characterized by distress and tension related to taking the exam, and it can be a motivator or an obstacle to performance, as motivating anxiety encourages one to perform seriously on the exam, while obstructive anxiety interferes to negatively affect performance (Rani 2025).

While the results of Table No. (3) showed the values of the arithmetic means for the male and female students, where the value of the arithmetic mean for the (male) students reached

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(126.3), which is less than the value of the arithmetic mean for the (female) students (178.3), while the value of the standard deviation for the (male) students reached (34.1), which is higher than the value of the standard deviation for the (female) students, which is (24.3), and this value indicates the measure of dispersion, as The value of the standard deviation for (females) is lower. This indicates that the dispersion rate for (females) is better and has greater credibility and accuracy than the answers of (males). In this regard, Lane (2020) explains this result by saying that a high level of perceived stress results in a high level of anxiety and fear of failure and failure in studies, which may lead to frustration and loss of hope, which results in a decrease in motivation for achievement (Lane et al. 2020).

The results of Table No. (4) showed the value of the Levene test, where the calculated F value was (11.488), and the significance value for this test is equal to (0.001), and since the significance value is less than the significance level of (0.05), this indicates the rejection of the zero equation and the acceptance of the alternative equation, meaning that there are significant differences between the genders. The (T-test) test is conducted for independent samples between (males and females), where the calculated value of (T) reached (8.776), at a degree of freedom (48), and the value of (Sig) was equal to (0.000), which is less than the significance level of (0.05). This indicates the presence of statistically significant differences in favor of the larger arithmetic mean, and since the arithmetic mean for the (female) students is greater than the value of the arithmetic means for the (male) students (Reilly et al. 2019), if Exam anxiety among females is greater than exam anxiety among males.

This difference in exam anxiety between the sexes can be attributed to the nature of human makeup; females tend to be highly conscientious and pay greater attention to exam-related details, whereas males often display an attitude of indifference and lack of anxiety regarding exam performance. As noted by Rashid (2025), these differences arise because female students in their fourth year of study possess higher levels of ambition to achieve their goals—specifically, completing their university education and attaining higher academic grades—compared to their male counterparts. These differences are clearly reflected in the methods of preparation and the number of hours female students dedicate to studying. This is corroborated by Putwain (2024), who identifies exam anxiety as a common issue among students; while such anxiety is normal when kept within reasonable limits, its manifestations vary from student to student (Putwain 2024). In some cases, the symptoms are pronounced, affecting the ability to recall academic material or answer questions, and leading to issues such as impaired concentration, distracted attention, tension, and irritability. The research concluded that female students in the fourth year at the College of Physical Education and Sports Sciences, University of Baghdad, experience higher levels of exam anxiety than their male counterparts.

Based on these findings, it is recommended that the causes of elevated exam anxiety among students at the College of Physical Education and Sports Sciences (University of Baghdad) be investigated and that appropriate measures be taken to address the issue. Furthermore,

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additional studies should be conducted to examine the relationship between exam anxiety and academic achievement across different samples and educational stages. It is also essential to raise awareness among teachers and educational specialists regarding the importance of addressing student exam anxiety, as it is a significant factor that negatively impacts academic success. Finally, efforts should be made to organize lectures, seminars, and workshops facilitated by psychology and psychiatry specialists to help students alleviate anxiety and enhance their ability to cope with exam-related pressures.

Appendix I

Sarson Test Anxiety Scale

N	Question	I strongly agree	I agree	I don't agree	I strongly disagree
1	I feel annoyed with every question the teacher asks me to make sure I benefit and learn the lesson.				
2	I am worried about whether I will be promoted from my current grade to the next grade at the end of the year.				
3	I feel nervous if the teacher asks me to stand up and read aloud.				
4	When the teacher asks me to solve some matters on the board, I hope to myself that he will ask someone else to do that and not from me.				
5	While I sleep, I dream a lot about exams.				
6	My heart rate increases when exams date approach.				
7	I feel very anxious when I get ready for bed because I think about how I will do on the exam tomorrow				
8	My writing hand trembles when the teacher asks me to write on the board in front of my class.				
9	I feel more nervous when the exam date approaches than my fellow students.				
10	When I am at home and think about tomorrow's lessons, I feel afraid that I will give wrong answers.				
11	If I miss school due to illness, I feel that my performance in homework will be lower than that of other students.				
12	When I think about the next day's lessons, I worry that my performance in some lessons will not be acceptable.				
13	I feel nauseous, trembling, or dizzy when the teacher asks a question to determine how much I learned from the lesson.				
14	I feel confused and stressed if the teacher asks me a question and I answer it wrong.				

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15	I feel afraid of every situation that involves an exam.
16	I feel very upset before taking the exam.
17	After finishing the exam, I feel nervous about my performance in this exam.
18	Sometimes I feel that my performance in the exam I took was bad, no matter how much I studied and prepared for it.
19	I feel that my writing hand is shaking a bit during the exam
20	I am afraid of failing in my performance if I know that the teacher will give us an exam.
21	I feel that I forget a lot of information during the exam that I remembered before it started.
22	I wish I did not feel so upset about the exam.
23	I feel anxious if the teacher tells me he wants to give us a test
24	I feel that I will perform poorly while answering the exam.
25	Sometimes when I am on my way to school, I am afraid that the teacher will give us a surprise exam.
26	I feel a severe headache before and during the exam.
27	My fear of failure hinders my performance and progress on the exam.
28	I feel anxious when the teacher announces how much time is left until the exam ends.
29	I feel afraid while waiting for the exam question papers to be distributed
30	I feel anxious during the exam that I will not have enough time to answer.
31	I feel anxious while waiting to enter the exam hall.
32	I feel afraid of school because it reminds me of exams.
33	I feel uncomfortable while students in the yard talk about an upcoming exam.
34	Sweat secretion increases on my hands or face during the exam.
35	I feel stressed and confused as I prepare for my daily exam.
36	I often feel anxious while preparing for the exam the day before it is due.
37	I always feel nervous and confused when preparing for the final exam.
38	I feel anxious when I listen to the teacher announcing the dates of the upcoming exams.

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The Effect of Using Small-Sided Games on Developing Learning of the 4–2 Playing System with the Setter in Position 2 among Physical Education and Sports Sciences Students

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Abstract

Physical education and sports science majors' ability to master the 4-2 formation with the setter positioned at position 2 was tested in a series of small sided game. The study employed a quasi-experimental design with both groups being measured before and after the intervention. A total of 44 undergraduates from Baghdad's College of Physical Education and Sports Sciences made up the sample. Each of the two groups of students (22 total) served as an experimental and control group. For six weeks the experimental group trained using only two on two games. Maintaining the status quo was the strategy used by the control group. Strategic decision-making, setter positioning and tactical performance were the three factors examined. An analysis was conducted on the data using SPSS version 26. On every measure that was considered the experimental group outperformed the control group statistically. Results from the follow up tests likewise favoured the experimental group. The findings suggest that playing in smaller teams can aid in the acquisition of the 4-2 system of play and the development of the setter's tactical function in position 2 Colleges of Physical Education and Sports Sciences should prioritise implementing structured small sided game into their volleyball curricula according to the study .

Keywords: small sided games, volleyball, 4–2 playing system, setter positioning, tactical performance.

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Introduction

Volleyball is not only a team sport but also a game of technical skills and tactical thinking carried out simultaneously by the individual players. The game is played in such a way that the players need to take decision on the fly, as the playing circle continuously keeps changing throughout. In volleyball there are not only individual skills like passing, setting or attacking to perform well. It is also conditional on the utilization of these skills within a defined playing system that organizes attacking and defending actions. The high match volume and players training circuit in the current study render this finding even less surprising as studies on volleyball match analysis report how technical-tactical actions are closely related to performance outcomes during play (Silva et al., 2016; Hassan & Abdulkareem, 2025).

Be Critical Students in Physical Education and Sports Sciences programs are trained in the initial stage with basic skills as well as tactical playing systems. These systems tell players where they are situated on the field, how they should move while playing and whether or not their position plays well with teammates. There are several models that exist for classifying the various playing systems existent in education, one of which includes the 4–2 playing system. It is little to no wrangling which works well for untrained learners, gets kids clear on basic offensive positions and team concepts (Hassan & Abdulkareem, 2026; Abdulhussein et al., 2026).

The 4–2 playing system incorporates a pivotal tactical position with the setter. The setter runs the offensive attack as well as how and where the ball will be passed or set. If you have the setter in position 2, however, this is where it gets a little tougher! Setter needs to work with front-row players, read opponent passing and make swift decisions in midplay. Previous studies show that setters must make critical offensive decisions in volleyball and that setting efficacy seems to be associated with a number of game-related variables such as reception quality, setting technique and setting tempo (Denardi et al., 2017; González-Silva et al., 2016).

More than half of the students noted that they struggled with applying the 4–2 in true game situations, due to the position numbered 2 being occupied by the setter. In isolated practice some students can execute volleyball skills, however, they run into problems when performing them in a game context. Traditional methods of teaching the sport often emphasize technical drills that are repeated more than tactical understanding and decision making (Shaker et al., 2025; Abdel Salam, 2025).

The role of game-based methods in the teaching of team sports. This is how students can learn in situations that bring them close to real competition. This form of learning aligns with pedagogies that develop performance, participation, and decision making through varying game situations (Light, 2012; Renshaw et al., 2010). One of these are more the small sided game. They minimize player count + change the field or rules of play. These changes will decrease the amount of players, which in turn increases their involvement and

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provides more realistic conditions for learners to develop movement and decision-making skills (Davids et al., 2013; Halouani et al., 2014). This provides players with more opportunities to receive the ball move make decisions and learn tactical concepts while playing. There is a recent findings this evidence the usefulness of game based approaches for decision making in sport learning (Abad Robles et al., 2020; González-Valero et al., 2024).

This rounded approach focuses on both technical and tactical roles which likely will serve volleyball playing systems, therefore small sided game may be useful in teaching those. Playing the game repeatedly gives students an opportunity to practice positioning, decision making and team organization. In a systematic review on small sided games in volleyball, de Oliveira Castro et al. (2022) reported that this strategy could function as a pedagogical and training tool for the educational and training contexts. Moreover, the same design with volleyball small sided game refers to how court spatial dimensions impact tactical-technical behaviour among novice volleyball players (Jorge Rodrigues et al., 2022) It is worth mentioning that further research needs to be conducted regarding the small sided game implementations of competencies in a particular volleyball system (4–2) such as when focusing on the setter at position 2.

This research investigates the impact of small sided game on mastering the 4–2 playing system with the setter positioned at 2 specifically among students in Physical Education and Sports Sciences. The research centers on three primary factors: tactical performance, decision-making and setter positioning during gameplay. The objective is to ascertain if small sided game facilitate students in implementing the 4–2 method more proficiently during actual volleyball scenarios. The objective is to juxtapose the outcomes of students educated via small sided game against those instructed using conventional teaching methods .

The research operates under the premise that small sided game could enhance the understanding of the 4–2 playing system. It is postulated that there will be notable statistical discrepancies between the pre-test and post-test outcomes of the experimental group for tactical performance, decision-making, and setter positioning favouring the post-test findings. It is posited that the control group might exhibit progress from the pre-test to the post-test albeit this enhancement will be less significant than that of the experimental group. It is ultimately posited that there will be statistically significant disparities between the experimental and control groups in the post-test outcomes favouring the experimental group.

By concentrating on a particular tactical position inside an organised playing framework this study could yield valuable insights for enhancing volleyball instruction in institutions of Physical Education and Sports Sciences .

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Methodology

Research Design

The research employed a quasi-experimental framework featuring pre-test and post-test assessments for two comparable groups. This design was employed to investigate the impact of small sided game on mastering the 4–2 playing system with the setter positioned at 2 among students in Physical Education and Sports Sciences. It is appropriate for educational and training research as it facilitates a comparison between the experimental and control groups both pre- and post-training accounting for the initial levels of both groups (Creswell & Creswell, 2017) .

Population and Sample

The study cohort comprised fourth-year students from the College of Physical Education and Sports Sciences at the University of Baghdad in the 2025/2026 academic year. Students in their fourth year were chosen as they had already acquired fundamental volleyball abilities and commenced the study of tactical elements of the game, as per the curriculum. Consequently they were better equipped to implement a training regimen pertaining to the 4–2 formation and the setter's responsibilities in position 2.

The sample comprised 44 students chosen by purposive sampling in accordance with the study's criteria. The criteria for selection encompassed being a fourth-year student consistently attending practical volleyball sessions, possessing fundamental volleyball skills and being devoid of ailments or medical issues that would hinder participation. Fundamental volleyball competencies were evaluated by instructor observation and an initial practical assessment before to commencing the experiment.

Following the selection of the sample the students were arbitrarily partitioned into two equal factions. The experimental cohort comprised 22 students and participated in the small sided game training regimen. The control group had 22 students and persisted with the conventional training approach.

To ensure equivalence between the two groups basic variables including age height and weight were measured. An independent-samples t test was used to compare these variables between the groups. The results showed no significant differences which indicates that the two groups were homogeneous before starting the experiment as shown in Table 1.

Table 1. *Baseline Characteristics and Group Homogeneity between the Experimental and Control Groups*

Variable	Experimental Group Mean ± SD	Control Group Mean ± SD	t-value	p-value
Age (years)	22.4 ± 0.7	22.3 ± 0.6	0.38	0.71
Height (cm)	171.6 ± 5.4	172.1 ± 5.2	0.31	0.76

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Weight (kg)	69.4 ± 5.8	70.1 ± 5.6	0.41	0.68

Research Instruments

The study used an observation checklist to assess students performance in the 4–2 playing system with a focus on the setter in position 2. The checklist was designed to measure three main variables ; tactical performance decision making and positioning during game situations.

Tactical performance was assessed through the students ability to apply the 4–2 system organize offensive play and cooperate with teammates. Decision making was assessed through the setter's ability to choose the suitable direction of the ball respond to the positions of teammates and opponents and make decisions at the correct time. Positioning was assessed through the setters movement readiness and ability to take the correct position during offensive organization.

The assessment was conducted during practical volleyball situations Each variable was evaluated using clear performance criteria prepared according to the objectives of the study. The observation checklist was reviewed by volleyball specialists to check its validity and suitability for measuring the study variables. Their comments were considered before using the final version of the checklist.

Reliability was tested using Cronbach's alpha, which reached 0.87. This value indicates an acceptable level of reliability for the assessment tool.

Small Sided Game Training Program

A six week training program was prepared based on small sided games. The aim of the program was to improve students learning of the 4–2 playing system with a focus on the setter in position 2. The program included one session per week and each session lasted 60 minutes. The difficulty of the activities increased gradually from week to week.

Each session was divided into three parts : a 10-minute warm-up a 45 minute main part and a 5 minute cool down. The warm up included general and volleyball specific exercises. The main part included 3×3 and 4×4 small sided games modified court dimensions and specific tasks for the setter. These tasks focused on organizing the attack distributing the ball, cooperating with front row players and making tactical decisions during play.

The training activities were arranged from simple to more complex situations. In the first weeks, the focus was on understanding the 4–2 system and the setters basic movement. In the following weeks the activities focused more on decision making attack organization and applying the system in game like situations.

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Table 2. *Weekly Small Sided Game Training Program*

Week	Session Goal	Warm-up (10 min)	Main Part (45 min)	Cool-down (5 min)
1	Introducing the 4–2 system and the setter's role	General warm-up and passing drills	3×3 games with required setter participation	Stretching and feedback
2	Improving setter movement and attack organization	Volleyball-specific warm-up	3×3 and 4×4 games with adjusted court dimensions	Stretching
3	Developing decision making under pressure	Dynamic warm-up	Competitive mini-games with limited decision-making time	Cool-down exercises
4	Linking the setter with front-row players	Ball warm-up	4×4 games simulating match situations	Performance discussion
5	Integrating technical skills with tactical duties	Specific warm-up	Combined small sided game with increased playing pace	Stretching
6	Applying and evaluating the full 4–2 system	Full warm-up	4×4 mini-matches applying the 4–2 system	Summary and feedback

The control group followed the traditional teaching method during the same six-week period. This method included explanation by the instructor, isolated technical drills, repeated passing and setting exercises, and general volleyball practice. The students practiced the skills separately, without using small sided game or modified game situations.

Research Procedures

The preliminary assessment was administered prior to the commencement of the training program. It was utilised to assess the efficacy of both teams inside the 4–2 formation emphasising the setter at position 2. Subsequently the experimental cohort engaged in the small sided games regimen for a duration of six weeks whereas the control cohort persisted with the conventional training approach. Upon conclusion of the training duration the post-assessment was administered utilising same evaluative tools.

Statistical Analysis

The data was analyze using SPSS version 26. Means and standard deviations was calculated for the study variables. Paired samples t-tests were used to compare the pre test and post test results within each group while independent samples t tests were used to compare the post test results between the experimental and control groups. Cohen's d was calculate to determine the effect size. The level of significance was set at $p \leq 0.05$ (Cohen, 2013; Field, 2024).

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Results

Table 3. *Experimental Group Pre- and Post-Test*

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Paired t-value	p-value	Cohen's d
Tactical Performance (Setter in Position 2)	56.8 ± 5.2	68.9 ± 6.1	7.24	p < 0.001	1.55
Decision Making	58.1 ± 4.9	70.2 ± 6.0	7.58	p < 0.001	1.62
Positioning	57.6 ± 5.5	69.1 ± 6.2	6.91	p < 0.001	1.47

Table 4. *Control Group Pre- and Post-Test Results*

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Paired t-value	p-value	Cohen's d
Tactical Performance (Setter in Position 2)	57.0 ± 5.3	60.5 ± 5.7	2.82	0.01	0.65
Decision Making	58.0 ± 4.8	61.2 ± 5.4	2.67	0.01	0.64
Positioning	57.5 ± 5.6	60.8 ± 5.8	2.55	0.02	0.61

Table 5. *Post-Test Group Comparison*

Variable	Experimental Group Mean ± SD	Control Group Mean ± SD	t-value	p-value	Cohen's d
Tactical Performance (Setter in Position 2)	68.9 ± 6.1	60.5 ± 5.7	4.71	p < 0.001	1.42
Decision Making	70.2 ± 6.0	61.2 ± 5.4	5.23	p < 0.001	1.58
Positioning	69.1 ± 6.2	60.8 ± 5.8	4.58	p < 0.001	1.38

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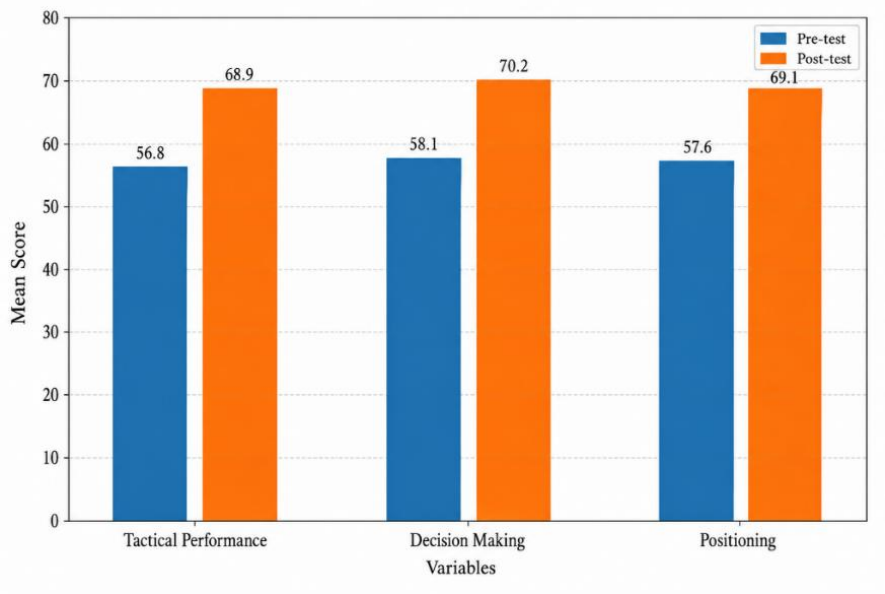


Figure 1. *Pre-test vs Post-test Mean Scores for the Experimental Group on Tactical Performance, Decision Making, and Positioning (n = 22)*

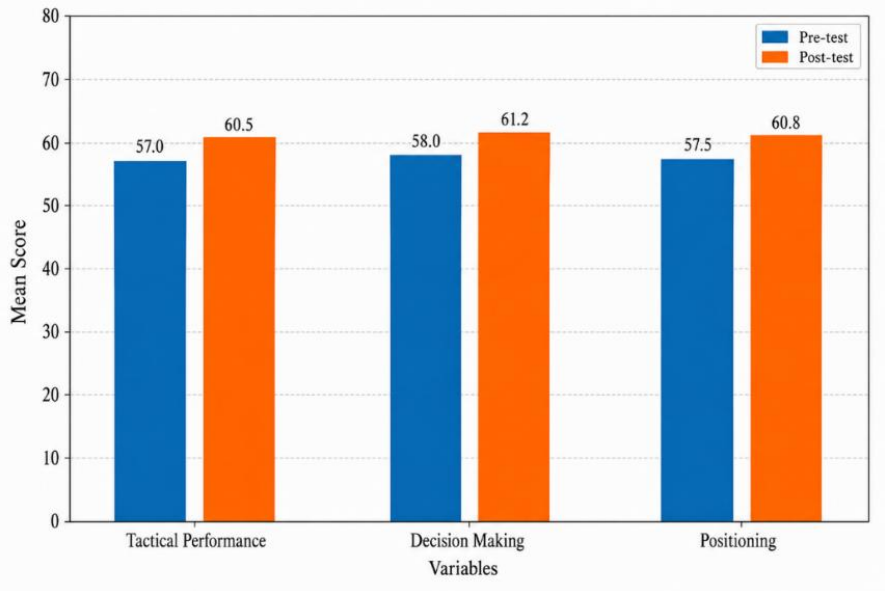


Figure 2. *Pre-test vs Post-test Mean Scores for the Control Group on Tactical Performance, Decision Making, and Positioning (n = 22)*

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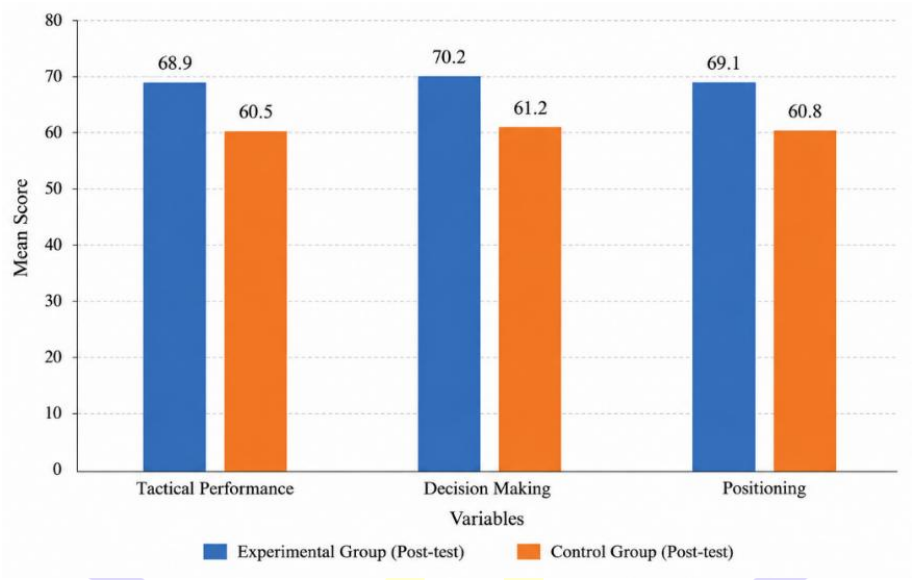


Figure 3. *Post-test Comparison of Mean Scores between Experimental and Control Groups on Tactical Performance, Decision Making, and Positioning (n = 22 per group).*

Discussion

The results in Table 3 showed clear improvement in the experimental group between the pre-test and post test. This improvement appeared in tactical performance decision making, and positioning. It may be related to the nature of small sided games. These games placed students in situations close to real volleyball play This supports previous findings that small sided games in volleyball can contribute to learning participation and tactical technical development within educational and training environments (de Oliveira Castro et al., 2022; Yousif, 2023). The idea of small sided and conditioned games facilitating the development of movement and decision making skills in team sports is indeed consistent with (Davids et al., 2013; Halouani et al., 2014).

The improvement in tactical performance suggest that students became better at applying the 4–2 playing system. The use of 3×3 and 4×4 games made the learning situation easier and more active. It helped students understand their roles inside the system. For the setter in position 2 this was important because the role requires organizing the attack, cooperating with front-row players and choosing the suitable direction of play. This is consistent with studies showing that setting performance in volleyball is affected by game related variables and by the quality of tactical organization during play (González-Silva et al., 2016) It is also supported by research showing that changing court dimensions in volleyball small sided games can influence tactical technical behavior among beginner players (Jorge Rodrigues et al., 2022; Alhayali & Khalif, 2022).

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The results also show improvement in decision making. During the training program the setter had to observe teammates and opponents before distributing the ball. Repeating this situations may have helped students read the game more clearly It also gave them practice in making decisions under changing conditions. This result is supported by research on the setters decision making in volleyball which shows that the setters choices are influenced by interactions between players and by the game environment (Denardi et al., 2017). Recent evidence also indicates that the setters decision making can be affected by interpersonal coordination and changing game conditions (Denardi et al., 2024).

The improvement in positioning can be explained in a similar way Positioning does not only mean standing in the correct place. It also depends on movement timing and understanding the development of play. Through small sided games students practiced these points in active game situations. This may have improved their awareness of where the setter should move during offensive organization This interpretation is consistent with game based learning approaches which emphasize learning through representative and changing game situation (Light, 2012; Renshaw et al., 2010).

The results at Table 4 show that the control group also improved between the pre test and post test. However this improvement was smaller than that of the experimental group. This may be due to regular practice and repetition of basic volleyball skills. The traditional method helped students practice skills but it gave fewer chances to apply the 4–2 system in realistic game situations This may explain why the improvement was limited compared with the experimental group as tactical and game based teaching approaches usually provide more opportunities for decision making and contextual skill use (Abad Robles et al., 2020).

The post test comparison in Table 5 showed differences in favor of the experimental group. This means that the small sided games program was more effective than the traditional method in improving the study variables. The reason may be that the program allowed students to practice technical skills and tactical roles together. This made the learning process closer to actual volleyball performance. Previous research also indicates that game based teaching approaches can improve decision making in sport learning because they expose learners to realistic and changing game situation (Abad Robles et al., 2020; González-Valero et al., 2024).

These findings support the use of game based teaching methods in volleyball instruction In volleyball students need to respond quickly cooperate with teammates and make decisions during changing situations. This is especially important for the setters whose decisions affect the organization of the attack and the performance of the team. Studies on volleyball match analysis also show that technical and tactical actions are closely connected with performance outcomes during play (Silva et al., 2016).

The findings indicate that small sided game serve as an effective instructional approach for mastering the 4–2 formation with the setter positioned at 2. The results must

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be interpreted considering the constraints of the study, such as the sample size, the six-week training duration and the educational environment .

Conclusions

The study concluded that small sided games had a positive effect on learning the 4–2 playing system with the setter in position 2. The experimental group showed greater improvement than the control group in tactical performance decision making, and positioning. This indicates the small sided games help students apply tactical roles more effectively during practical volleyball situations.

The results also show that practicing in game like situations gave students repeat opportunities to organize the attack cooperate with front row players distribute the ball and make decisions under changing conditions. This helped connect technical skills with tactical understanding in a practical way.

The research further concludes that altering the number of participants court measurements and gameplay activities might enhance student engagement and foster active learning. Consequently organised small sided game can be regarded as an effective approach in volleyball instruction particularly for enhancing tactical comprehension and essential positions like the setter.

The findings support the use of small sided games in volleyball instruction in colleges of Physical Education and Sports Sciences. However the results should be understood within the limits of the sample size the 6 week program and the educational setting of the study.

Recommendations

Based on the findings in this study volleyball instructors are advised to use small sided games when teaching the 4–2 playing system. This is especially useful when developing the role of the setter in position 2. These games should be designed to create situation close to real play and to give students repeated chances to move cooperate and make decisions.

It is also recommended to change the number of players court dimensions and playing tasks gradually during training. This can help students move from simple situations to more complex tactical situations. It can also improve their understanding of the games.

Colleges of Physical Education and Sports Sciences is encouraged to include game based teaching methods in volleyball lessons. this method may help students develop technical and tactical skills in a more practical way.

Future studies should be conducted on larger samples and on other volleyball positions. It is also recommended to study the long term effect of small sided games on

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tactical learning Future research may also use tool such as video feedback or performance analysis to support the teaching process.

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The Effect of a Modified Mini-Games Strategy on Some Basic Skills and Motivation to Learn Volleyball Among Intermediate School Students

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Abstract

This research explored the impact of a modified mini-games strategy on some basic skills and motivation to learn volleyball among intermediate school students. The researchers adopted an experimental approach with a two-group pre-test/post-test design. The sample consisted of 40 students with a mean age of 13.78 ± 0.41, a mean height of 1.57 ± 0.06 m and a mean body mass of 49.85 ± 6.31 kg. The sample was separated into an experimental group and a control group, with 20 students in each group. The experimental group implemented 16 educational units based on the modified mini-games for eight weeks while the control group received the standard instruction. The students' performance in underhand passing, overhand passing and underhand serving skills was measured as well as their motivation to learn volleyball. The researchers used the Statistical Package for the Social Sciences (SPSS) to process the data, calculate means, standard deviations, t-test values, percentage of improvement and effect size. The data presented a statistically significant development in the experimental group across all variables and it also outperformed the control group in post-tests at a significance level of 0.05. The research indicates that modified mini-games can provide greater opportunities for participation, repetitive, purposeful performance, collaboration and a sense of competence during learning.

Keywords: modified mini-games, volleyball, basic skills, motivation, middle school students, training model.

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Introduction

Volleyball is a team sport that demanded learning a set of fundamental skills, primarily underhand and overhand passes and serving, along with motor coordination, situational awareness, decision-making and teamwork. Teaching these skills in middle school is especially important as this stage provides a suitable foundation for building motor skills and developing positive attitudes and motivation regarding participating in sports activities. (Apriani, A., & Lestari, H. 2026)

Physical education teachers face many challenges when teaching volleyball consisting of a large class sizes, limited lesson time, varying skill levels and limited equipment and provisions in some schools. Excessive reliance on isolated skill drills or traditional methods can lead to increased waiting times, fewer ball touches per student and limited chances for active participation which may negatively affect the speed of acquiring basic skills and motivation to learn. (Sobari, DF, Juliantine, T., & Hambali, B. 2025)

One technique that can help address these challenges is the adjusted mini-game strategy. This strategy included organizing educational situations that resemble real games while integrating pedagogical modifications appropriate to the students' age, skill level and the school environment. These modifications include decreasing the number of players, minimizing the playing field, adjusting the net height, using suitable balls, simplifying the rules or utilizing specific rules to reach a particular educational objective. For example the activity can be organized in small groups of two or three students and scoring can be related to specific skill performance such as finishing a certain number of passes before sending the ball into the opponent's court or directing it towards a designated goal area.

Mini-games are not simply unstructured free activities but rather a teaching method that combines a competitive, motorized environment with progressive learning, feedback and guided questioning. Through this approach students move from practicing skills in isolation to applying them within situations that require receiving, passing, directing, cooperating, and making decisions. Mini-games also provide greater opportunities for active participation and ball handling, which helps improve skill performance and fosters a sense of competence, enjoyment, and belonging among students. (Endriani, D. 2026).

Modern Arabic literature indicates that learning sports skills does not depend solely on motor repetition, but is linked to the quality of the learning environment and the extent to which learners are given the opportunity to think, participate, cooperate, and apply the skill in conditions closely resembling play. A study by Al-Razzaq (2026) demonstrated that using the pentagram strategy as a modern teaching tool in teaching the chest pass and shot put skills in basketball to junior players contributed to the experimental group's superior skill performance. The study attributed this to the gradual organization of the skill, the stimulation of thinking and cooperation, and the learners' intrinsic motivation. Al-Razzaq (2026) believes that modern teaching strategies support skill performance and motivation. This reinforces the importance of employing active teaching strategies in physical education lessons, including modified mini-games that adapt the learning environment to suit the

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students' age and skill level. Gradual organization and cooperation contribute to improving the learning of sports skills. (Al-Razzaq, 2026)

In volleyball, a study by Aziz (2025) demonstrated a positive correlation between critical thinking skills and the performance level of the underhand pass skill among fourth-grade preparatory school students. Higher critical thinking skills were associated with improved skill performance. This finding underscores that learning volleyball skills should not be limited to imitating movement patterns but should include learning situations that encourage students to perceive the ball's direction, choose the appropriate position, cooperate with teammates, and make decisions. This highlights the suitability of the modified mini-game strategy as it places students in simplified and repetitive game situations that combine skill performance, understanding, and interaction. The study demonstrated a positive relationship between thinking and performance in underhand passing in volleyball. (Aziz, 2025)

Based on this the importance of the present research is determined to identify the impact of the modified mini-games strategy on learning some basic skills and motivation towards learning volleyball among middle school students as an organized teaching alternative that can raise the effectiveness of the physical education lesson and achieve more active and interactive learning.

The research problem depend on the fact that learning basic volleyball skills among middle school students may face obstacles related to the nature of the school lesson. These difficulties include the limited time allocated for physical education classes, the large number of students, the varying levels of their motor skills and capacities and the limited opportunities to actually touch the ball when activities are organized in a traditional manner or in large teams. In some lessons a number of students may be preoccupied with waiting or watching their classmates, while only a limited number of them receive repeated opportunities to practice and perform. This can negatively impact the speed of learning and the accuracy of executing passing and serving skills.

Moreover simply explaining, demonstrating and performing repetitive classroom exercises may not provide students with sufficient learning situations that connect a skill to its application in play, such as estimating the ball's trajectory, choosing a position, timing a pass, cooperating with a teammate and returning the ball to the opponent's court. This may lead to students learning aspects of the performance in isolation, but then struggling to apply them during simple play situations or classroom competitions.

The findings of the study (Aziz, 2025) indicate that the level of performance in the skill of passing from below is connected to the thinking skills of middle school students which supports the need to construct educational situations that do not focus on isolated motor performance only but let learner to understand, make decisions and interact with the ball and colleagues.

The modified minigame strategy offers a potential learning environment to address this problem because it decrease the number of players on a team, modifies the playing area,

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net height, rules, and equipment and sets particularly skill objectives within a simplified competitive activity. These modifications are expected to increase participation time, ball touches, the frequency of purposeful play and opportunities for success and collaboration, potentially contributing to the learning of fundamental skills and boosting motivation to learn.

Based on the researchers' practical experience and observations of physical education classes in middle schools, they noted the need for structured teaching methods that empower students to play a more vital role in learning volleyball, rather than relying solely on individual performance or prolonged waiting periods. Furthermore available Arabic studies have often focused on other strategies or different sample sizes, while the need remains to test the modified mini-games strategy with middle school students in Baghdad's Third Karkh Education Directorate.

Therefore, the research problem can be summarized in the following main question:

What is the effect of the modified mini-games strategy on learning some basic skills and motivation towards learning volleyball among middle school students in Baghdad Al-Karkh Third Education Schools?

This question leads to the following two questions:

1. What is the effect of the modified mini-games strategy on learning the accuracy of underpassing, overpassing, and underpassing among middle school students?
2. What is the effect of the modified mini-games strategy on increasing motivation to learn volleyball among middle school students?

Research objectives

1. Developing an educational curriculum according to the modified mini-games strategy to teach some basic skills and motivation towards learning volleyball among middle school students.
2. A statement of how to identify the impact of the educational curriculum on learning the accuracy of scrolling from below among members of the experimental group.
3. A statement of how to determine the effect of the educational curriculum on learning the accuracy of top-down passing among members of the experimental group.
4. A statement of how to detect the effect of the educational curriculum on learning the accuracy of the downward transmission among members of the experimental group.
5. Explaining how to distinguish the impact of the educational curriculum on raising motivation towards learning volleyball.
6. A statement of the method of comparison between the experimental group and the control group in the post-test measurements.

Research hypotheses

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1. There are statistically significant differences between the pre-test and post-test for the experimental group in the accuracy of the underpass pass, the overpass pass, the underpass serve, and the motivation to learn volleyball, in favor of the post-test.
2. There are statistically significant differences between the pre-test and post-test for the control group in the research variables, in favor of the post-test.
3. There are statistically significant differences between the experimental and control groups in the post-tests of basic skills and motivation towards learning volleyball, in favor of the experimental group.

Search terms

The modified mini-games strategy: It is an educational strategy based on organizing simplified game situations that simulate the game of volleyball, with intentional modifications to the number of players, dimensions of the court, height of the net, type of ball, rules, and scoring system; in accordance with the age of the students, their skill level, and the goal of the educational unit.

Methodology and Tools

Research Methodology

The researchers used an experimental design with two equivalent groups, employing pre-tests and post-tests. This design is appropriate for studying the effect of an independent variable, the modified mini-games strategy, on dependent variables: underhand passing accuracy, overhand passing accuracy, underhand serving accuracy and motivation to learn volleyball.

Research Sample

The sample consisted of 52 second-year intermediate students from one school (Al-Kadhimiyah Intermediate School for Boys). They were randomly assigned to:

Experimental Group: 20 students who learned using the modified mini-games strategy, all from section (C).

Control Group: 20 students who learned using the standard method, all from section (B).

Pilot Sample: 12 students from section (E).

The students' ages ranged between 13 and 14 years. None of the students in the sample were regular players in a volleyball club.

Table 1. *Statistical Description of Sample Characteristics*

Variable	Experimental Group n = 20	Control Group n = 20	t-value	Significance

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Age (years)	13.79±0.40	13.77±0.43	0.15	0.879
Height (meters)	1.574±0.058	1.568±0.061	0.32	0.750
Body Mass (kg)	50.10±6.45	49.60±6.24	0.25	0.804

Table 1 shows that there are no statistically significant differences between the two groups in age, height and body mass, indicating homogeneity between the groups in these variables within this educational framework.

Table 2. *Equivalence of the two groups in dependent variables before application of the method*

Variable	Experimental Mean ± SD	Control Mean ± SD	t-value	Significance
Bottom-up passing (out of 20)	7.35±1.53	7.20±1.47	0.32	0.753
Top-up passing (out of 20)	6.90±1.41	6.85±1.46	0.11	0.913
Bottom-up passing (out of 30)	9.25±2.07	9.10±2.00	0.23	0.821
Motivation (out of 100)	61.80±5.94	62.10±6.11	0.16-	0.873

Table 2 shows no statistically significant differences between the two groups in the pre-tests for basic skills and motivation indicating that the groups were equivalent before the curriculum was implemented.

Devices and tools

The researchers used the following tools in the educational curriculum:

- Ten lightweight educational flying balls, the circumference of the ball is 65 to 67 cm and its mass is 200 to 220 grams.
- An adjustable volleyball net, with an educational height of approximately 2.10 m in the first units and then gradually increasing to 2.24 m.
- A metal measuring tape with a length of 30 m and an accuracy of 0.01 m.
- Digital stopwatch with 0.01-second accuracy to regulate activity duration.
- Cones and ground strips to mark playing areas and goal areas.
- Forms for recording grades.
- A measure of motivation towards learning volleyball.

Skills tests

First: Testing the accuracy of passing from the bottom to the goal

The student stands behind a line 3 meters from a wall or marked target area. They make 10 passes from below towards a 1 x 1 meter target square. The student receives two points for hitting the target directly one point for touching the target boundary and zero points for missing. The total score for the test is 20 points.

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Second: Testing the accuracy of a pass from above to a goal

The student stands 2.5 meters from the wall or target. They perform 10 overhead passes towards a 1x1 meter target box. Performance is graded as follows: 2 points for direct hits, 1 point for touching the target boundary and 0 points for no hits. The total score is 20 points.

Third: Testing the accuracy of transmission from below

The student stands behind the service line and performs 10 serves from below into a court separated into four target areas. The student receives three points for hitting the target center area, two points for hitting the designated side area, one point for a legal serve within the court outside the target areas and zero points for a serve that is out of bounds or illegal. The total score is 30 points.

Motivation scale for learning volleyball

The scale consisted of 20 items covering attitudes connected to the intention to learn, perseverance, sense of competence, cooperation and interest in the volleyball lesson. A five-point scale was used for responses: strongly agree, agree, neutral, disagree and strongly disagree.

The total score ranges from 20 to 100 points with higher scores indicating greater motivation to learn volleyball. Six negative items are scored in reverse when calculating the total score.

Honesty and steadfastness

The tests and motivation scale items were presented to ten experts in the fields of physical education and volleyball teaching methodologies as well as measurement and evaluation. Nine or ten experts approved the validity of the instruments after two items on the motivation scale were reworded.

A pilot study was conducted with 12 students outside the main sample and the tests and scale were re-administered after seven days. The test-retest reliability coefficients were:

stability coefficient	The tool
0.88	Scroll down test
0.86	Top-down swipe test
0.90	Bottom transmission test
0.89	Motivation scale

Experimental procedures

Pre-testing was conducted over two consecutive days. The first day was dedicated to anthropometric measurements and skills assessments while the second day was dedicated to administering a motivation scale. Following this the curriculum was applied for eight

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weeks, with two learning units per week, totaling 16 learning units. Each learning unit lasted 45 minutes.

The experimental group received the modified mini-game-based curriculum, while the control group received the standard curriculum based on explanations, demonstrations and individual, paired and classroom exercises. After the completion of Unit 16 post-tests were administered under the same organizational conditions as the pre-tests.

The educational approach for the experimental group

The curriculum was applied in the primary part of the learning unit for a period ranging between 25 and 28 minutes. The learning activities were organized in small teams such as 2 against 2, 3 against 3 and 4 against 4. Miniature pitches with approximate dimensions of 12 x 6 m were used, with the rules being changed according to the skill objective of the unit.

The changes included awarding an extra point to the team that completed three successful passes, or to the team that directed the ball into a goal area or to the team that correctly received and set up the ball before returning it to the other side of the court. One bounce of the ball was allowed in the initial beginners' units but this rule was gradually eliminated.

Table 3. *Weekly Training Program and Modified Mini-Games for Developing Volleyball Skills and Decision-Making*

Week	Units	skill or goal	Examples of modified minigames
First	1–2	Adapting to the ball and putting on the readiness	2 vs 2 over a low rope, passes into colored zones
Second	3–4	Scroll down	Three passes then a point, and protect the goal area.
Third	5–6	Scroll from top	Set up a pass to the box, and play 3v3 with two mandatory passes.
Forth	7–8	Merge two passes	3 vs 3 with an extra point for the correct sequence
Fifth	9–10	Send from below	Hitting target areas, serving, then entering play
Sixth	11–12	Reception and preparation	Small teams with organized role exchange
Seventh	13–14	Decision-making and cooperation	3 vs 3 with graduated rules and point zones
Eighth	15–16	Performance monitoring and evaluation	Mini league and application of skills in play

Statistical Analysis

The following statistical analyses were used in the data analysis:

- The arithmetic mean.
- Standard deviation.
- Independent samples t-test.

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- T-test for related samples.
- Percentage of improvement.
- Cohen effect size. d

Results

Table 4. *Differences between the Pre-Test and Post-Test for the Experimental Group*

Variable	Pre-Test Mean ± SD	Post-Test Mean ± SD	Difference in Means	Percentage of Improvement%	T-value	Significance
Scroll from bottom of 20	7.35±1.53	14.80±1.88	7.45	101.36	15.27	0.001>
Scroll from top of 20	6.90±1.41	14.05±1.76	7.15	103.62	16.11	0.001>
Scroll from bottom of 30	9.25±2.07	20.35±2.49	11.10	120.00	17.84	0.001>
Motivation out of 100	61.80±5.94	78.65±5.28	16.85	27.27	12.63	0.001>

Table 5. *Differences between the Pre-Test and Post-Test for the Control Group*

Variable	Pre-Test Mean ± SD	Post-Test Mean ± SD	Difference in Means	Percentage of Improvement%	T-value	Significance
Scroll from bottom of 20	7.20±1.47	10.55±1.68	3.35	46.53	7.02	0.001>
Scroll from top of 20	6.85±1.46	9.95±1.62	3.10	45.26	6.71	0.001>
Scroll from bottom of 30	9.10±2.00	13.90±2.20	4.80	52.75	8.09	0.001>
Motivation out of 100	62.10±6.11	66.40±5.83	4.30	6.92	3.31	0.004

Table 6. *Differences between the two groups in the post-tests*

Variable	Experimental Mean ± SD	Control Mean ± SD	t-value	Sig.	Sig d
Scroll from bottom of 20	14.80±1.88	10.55±1.68	7.54	0.001>	2.38
Scroll from top of 20	14.05±1.76	9.95±1.62	7.64	0.001>	2.42

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Scroll from bottom of 30	20.35±2.49	13.90±2.20	8.66	0.001>	2.74
Motivation out of 100	78.65±5.28	66.40±5.83	6.98	0.001>	2.21

Discussion

The data showed an improvement in the performance of both groups between the pre- and post-tests. The expected improvement in the control group can be explained by the impact of structured exposure to the lesson, repetition of performance, explanation, demonstration and practical application of the skills. However the data indicated that the experimental group showed greater improvement in all three skills and in motivation to learn volleyball.

From an educational perspective the superiority of the modified mini-game strategy can be explained by the fact that reducing the number of players increases the chances of touching the ball and reduces the student's waiting time. For example a student participates more in a 3-on-3 situation than in a 6-on-6 situation because there are fewer players involved more space for movement and greater opportunities to pass, receive and serve. (Ibrahim Shehab, A., 2026)

Furthermore, linking points to a skill requirement such as three successful passes before sending the ball into the opponent's court, ensures the student performs the skill with a clear purpose within the activity. This approach helps shift from mechanically performing the movement to applying it in a simplified game situation. In addition varying the challenges such as playing in goal zones, changing the number of touches, or switching roles, can prevent monotony and increase student focus. (Isma, Baan, AB, Rahmah, & Liloi, DK 2026).

This interpretation aligns with modern trends in physical education that support active learning and student-centered models. Recent studies have indicated that skill-based learning and game-based skills can be enhanced by using learning for understanding in games and play-based learning in volleyball. Furthermore present research has explored the improvement of volleyball instructional models for students including a model for teaching serving through play-based learning and models for developing underhand passing, highlighting the importance of adapting the learning environment to the learners' level (Apriani, L., Bausad, AA, Alpen, J., Amran, Z., & Setiawan, BA 2025).

Regarding the motivation variable, small-scale games can enhance student participation because they increase a sense of teamwork, provide frequent opportunities for success, offer immediate feedback and reduce fear of making mistakes in front of a large group. This can boost students' sense of competence and their desire to continue learning. Furthermore simple, structured competition between small teams makes the lesson more engaging, provided the teacher focuses on reinforcement and learning not just winning.

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Conclusions

1. The experimental method with two equivalent groups and pre- and post-tests is acceptable for studying the impact of modified mini-games on learning volleyball.
2. The data demonstrated an improvement in the accuracy of bottom scrolling, top scrolling, bottom sending and motivation among the members of the experimental group.
3. The data showed that the experimental group outperformed the control group in the post-test measurement of all variables.
4. Modified mini-games represent a viable teaching method in schools when considering the number of students, the playing area, the tools and the level of performance.

Recommendations

1. Adopting modified mini-games within the physical education lesson to learn basic volleyball skills with a clear progression in the difficulty of the tasks.
2. Organize the students into small groups of 2 against 2, 3 against 3, or 4 against 4 to ensure increased participation and repetition of ball touching.
3. Adjusting the dimensions of the court, the height of the net, the type of ball and the rules of play to connect with the age and skill level of the students.
4. Training physical education teachers to design mini-games that link a specific particularly skill objective with a suitable game rule or point system.
5. Conduct follow-up studies comparing the mini-games strategy with the cooperative learning strategy, the flipped classroom, blended learning or direct instruction in volleyball skills.

Appendices

Appendix 1: Sample Learning Unit

Unit number: Fifth

Main skill: Passing from below

Total time: 45 minutes

Section	Time	Unit Content	Organizational Notes
Introductory	8 minutes	Light running, joint movements, individual ball passing	Observing social distancing and safety
Educational	7 minutes	Explanation and demonstration of the ready position, knee bending, arm extension, and ball aiming	Use short keywords

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First application	8 minutes	Groups of 3 students perform 10 passes from below into a goal area	Constantly switching roles
Second application	12 minutes	3v3 game: Regular point for winning an exchange and an extra point after three successful passes	Miniature playground 12 x 6 m
Third application	5 minutes	A game where you score by passing the ball from the bottom into a square in the opponent's half.	Team score recording
Final	5 minutes	Calming down, technical review, and enhancing good performance	Focus on participation and collaboration

Behavioral objective: For the student to perform a pass from below towards a teammate or to a target area with appropriate accuracy during miniature play situations.

Behavioral objective: For the student to perform a pass from below towards a teammate or to a target area with appropriate accuracy during miniature play situations.

Appendix 2: Motivation Scale for Learning Volleyball

Instructions: Put a checkmark next to the answer that expresses your opinion: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.

1. I feel excited when I learn a new skill in volleyball.
2. I try to develop my performance even when I make a mistake in the skill.
3. I eagerly await the volleyball lesson.
4. I enjoy collaborating with my teammates during volleyball activities.
5. I believe I am capable of learning volleyball skills if I train regularly.
6. I participate actively when the teacher asks me to perform a volleyball skill.
7. I am looking for an additional opportunity to play volleyball.
8. I feel satisfied when I succeed in directing the ball accurately.
9. I encourage my colleagues during the educational activity.
10. It is best to avoid participating in the volleyball lesson.
11. I feel that learning volleyball is useful in physical education class.
12. I keep trying when my first attempt is unsuccessful.
13. I can concentrate while learning volleyball skills.
14. I feel confident when performing a pass or a send.
15. I don't care about learning the rules of volleyball.
16. The best activities that allow me to touch the ball and participate continuously.
17. I feel that my opinion matters when working with my team.
18. I accept technical feedback to improve my performance.
19. I get bored quickly when learning volleyball.
20. I want to improve my level in volleyball.

Correction method: Positive items are given scores from 5 to 1 based on to the answer alternative while negative items are marked with scores of 10, 15 and 19. A higher score indicates higher motivation towards learning volleyball.

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The Effect of Special Exercises Using a Mirror on Learning the Back Roundhouse Kick (Hajw - Jaki) among Taekwondo Learners Aged 12–14 Years

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Abstract

This research objectives to determine the impact of utilizing a mirror as a teaching tool on learning the back roundhouse kick (Hajw - Jaki) in Taekwondo among learners aged 12-14. The researcher used an experimental design with two equivalent groups. The research sample consisted of 20 learners randomly separated into two same groups: an experimental group of 10 learners who learned using a mirror and a control group of 10 learners who learned using the traditional method without a mirror. The experiment lasted for six weeks with three training sessions per week, totaling 18 training sessions .The researcher used a form to evaluate the skill performance of the back roundhouse kick and employed pre- and post-tests to measure learning levels. The learning conditions for both groups were standardized in terms of coach, time, content, location and number of repetitions with the only difference being the use of a mirror. The data were statistically analyzed using the mean, standard deviation and t-tests for paired and independent samples.The results present a statistically significant development in the performance of both groups between the pre- and post-tests with the improvement being greater in the experimental group. The findings also indicated no significant differences between the two groups in the pre-test while significant differences emerged in the post-test in favor of the experimental group demonstrating the effectiveness of using a mirror in improving skill learning. The research concluded that the mirror is an effective teaching tool for learning complex motor skills in Taekwondo as it provides immediate visual feedback that contributes to correcting errors and improving balance, accuracy and motor coordination. The research recommended its adoption in teaching Taekwondo learners aged 12-14 and conducting similar studies on other skills and age groups.

Keywords: Taekwondo, Teaching Mirror, Visual Feedback, Motor Balance.

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Introduction

Taekwondo is a martial art that has witnessed significant development in both training and competition, due to its complex motor skills that rely on speed, neuromuscular coordination and precision. Kicking is a fundamental aspect of this sport, serving as the primary means of scoring points and achieving dominance during competitions.

Scientific literature supports this view; performance analyses in high-level taekwondo competitions indicate that the technical and tactical actions leading to scoring are strongly connected to the strategic use of kicks in accordance with the demands of the competitive situation. Furthermore biomechanical studies demonstrate that kick effectiveness relies on the terminal velocity of the foot, the contribution of the torso and rotation and the coordinated movement sequence between body parts. This reinforces the view of kicking skills as a fundamental factor of technical and competitive superiority in taekwondo (Menescardi et al., 2019; Jung & Park, 2022).

Among these skills, the backhand roundhouse kick to the head (Hajju-Jaki) stands out. It is performed with a full body rotation raising the leg straight and then bending it. The kick is delivered with the sole of the foot while bent and with the heel when the leg is straight. The execution is performed from the same movement as in a sparring match and a successful kick to the head by the player in a sparring match can earn six points. This skill is considered one of the advanced skills that demands a high degree of balance, motor coordination and precision in directing the movement. It also comprises a backward rotation of the body while directing the strike towards the target, which demands high kinesthetic awareness and the capacities to control the body parts during execution. Teaching and developing this skill requires following scientific methods that enhance traditional scientific processes given the precise coordination and synergy required by all parts of the body particularly since this skill demands the transfer of movement through the body's joints and the synergistic action of the working muscles.

Biomechanical studies of taekwondo kicks support this description; they have shown that back kicks and rotational kicks require precise coordination between the hip, knee and torso joints, and that the speed and effectiveness of the kick are linked to the synergistic pattern between the joints and the phases of rotation and attack, as well as the role of the pivot leg in maintaining balance and control during execution. Moreover this skill is considered a complex skill that demands a high level of motor control and mechanical precision (Kim et al., 2011; Cheng et al., 2015).

The 12-14 age group is important stage in learning motor skills characterized by a high capacity for learning due to continuous development in the nervous system and enhanced coordination. This stage represents a significant foundation for building correct movement patterns upon which advanced skill performance in later stages depends. However the complex nature of the backhand roundhouse kick can pose a challenge for

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learners due to limited visual perception during the execution of the movement, potentially leading to errors in balance or direction.

Recent reviews demonstrate that learning motor skills in late childhood and early adolescence is associated with significant cognitive-motor advantages and that developing coordination, agility, and motor experience during this period contributes to constructing a better foundation for subsequent skill learning. Studies of taekwondo players aged 11–14 years have also shown that practice is related to with faster development of postural control and sensory functions connected to balance as well as better adaptations in responding to specific visual stimuli related to the sport—all of which are crucial elements in learning compound kicks that require rotation and precise direction of movement (Shi & Feng, 2022; Fong et al., 2012; Chung & Ng, 2012). In light of the development in sports training methods the importance of using assistive educational tools that contribute to improving the motor learning process has emerged. Among these tools is the mirror, which provides immediate visual feedback, enabling the learner to see his performance during execution and compare it to the correct model of the movement. This idea connect with the findings of systematic reviews in motor learning. Evidence suggests that feedback is a important factor in improving skill acquisition during motor lessons and educational programs. Visual feedback, consist of visual modeling and performance review may be more effective than verbal instruction alone in some educational contexts because it helps learners identify errors and connect actual performance to the desired model. Therefore a mirror can be considered a simple tool for providing immediate visual feedback during learning (Zhou et al., 2021; Mödinger et al., 2022).

This helps promote self-correction of errors and the development of a clear kinesthetic perception of movement. Furthermore using a mirror strengthens the connection between kinesthetic sensation and visual perception which helps learners better understand body positions and angles of rotation, thereby developing performance accuracy and speed and decreasing motor errors. The significance of this research lies in highlighting the use of mirrors as a teaching tool in learning one of the fundamental skills in Taekwondo the back roundhouse kick to the head (haju-jeki), among Taekwondo learners aged 12–14 years. This may contribute to the development of teaching and training methods in this sport.

Regarding mirrors specifically available evidence suggests that mirror visual feedback may contribute to supporting motor representation and sensory-motor perception in several contexts. However, systematic reviews also indicate that direct evidence for improved motor performance in healthy individuals remains limited and inconsistent. Therefore the most scientifically accurate formulation of this study is that mirror use may aid in self-correction and improve coordination and visual-motor perception during the learning of the back roundhouse kick to the head. This gives the research practical and experimental value within the context of teaching Taekwondo to young people (Chen et al., 2019; Deconinck et al., 2015).

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Method and Tools

The researcher used the experimental method with two equivalent groups (experimental and control) as it was appropriate for the nature of the research problem. The research population included of 72 Taekwondo learners of meltable ages at the (Olympic Champion School) club in Baghdad Governorate. The research sample was chosen purposively and the sample consisted of (20) learners aged (12-14) years and they were randomly divided into two groups: an experimental group that learned using its exercises with a mirror and a control group that learned using the traditional method used in teaching. Equivalence was achieved between the members of the two groups in the level of skill performance before the start of the experiment.

The researcher used a range of tools and methods including skill performance evaluation forms, two large mirrors, taekwondo training equipment, a mobile phone camera and a skill test for performing the back roundhouse kick to the head. The technical performance evaluation test for the back roundhouse kick to the head based on the " Hajw - Jaki " movement, was adopted as described below (Al-Farijawi, 2023).

Test name: The roundhouse kick to the head from the movement (Hajw - Jaki).

The aim of the test: To measure the skill performance of the back roundhouse kick to the head from the (Hajju-Jaki) movement.

Tools used:

- Taekwondo electronic scoring device (electronic head guard).
- A gelatinous marker onto which the electronic head guard is attached.
- Sensitive sole of the foot.
- Points recording form.
- Whistle.

Test instructions:

- Each player is given three attempts.
- The score is out of 10 for each attempt.
- The player chooses his favorite man when performing.
- If the attempt is inaccurate (the main part of the kick), it is considered a failure and no marks are given.
- A registration form is distributed to the experts (arbitrators) that includes dividing the skill into three parts: the preparatory part (3 marks) the main part (4 marks) and the concluding part (3 marks).
- The electronic scoring device specific to Taekwondo (head guard) was used to determine whether the attempt was correct (accurate) or not.

Method of performance

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- The player stands in the taekwondo ready stance after choosing his preferred leg for the performance.
- In front of the testing device, make sure that the distance between the player and the testing device is appropriate (taking into account the height difference between the players) and upon hearing the starting signal (whistle) the player begins to perform the back important kick to the head from the movement on the testing device and then returns to the ready position after performing.

Registration

• Calculate the best score from the three attempts of the back roundhouse kick to the head from the (Hajw - Jaki) movement.

In order to ensure the success of the research experiment the researcher conducted a pilot experiment on (5) learners outside the research sample in order to establish the suitability of the exercises using the mirror and to ensure the validity of the tests and tools used. This was followed by the implementation of the educational program for (6) weeks with (3) educational units per week, i.e., 18 units. The experimental group implemented the exercises using the mirror while learning the back roundhouse kick to the head while the control group received the education according to the traditional method followed. The researcher ensured that the content was the same for both groups in terms of skill order, progression from easy to difficult, number of repetitions, rest periods, unit time, and trainer explanation; so that the only difference (independent variable) would be the use of the mirror for the experimental group.

The proposed learning unit was divided into

- Introductory section (10 minutes): General and specific warm-up, flexibility exercises and activation of the working joints.
- Main section (45 minutes): Skill explanation, performance demonstration, partial and then full exercises, repeated applications, feedback and error correction.
- Concluding section (5 minutes): Cool-down and brief review of technical points.

The teaching mechanism in the experimental group for this skill involved using a mirror as a means of immediate visual feedback. During the performance the learner was needed to observe the position of the supporting foot, the direction of rotation, the height of the knee, the trajectory of the kick, the balance of the torso and the return to the starting position. The coach also used the mirror to direct the learner's attention to areas of error and to compare it with the correct model. This approach is based on literature indicating that feedback is beneficial in learning motor skills, and that visual feedback may be particularly useful for skills requiring form control, precision and coordination of body positions. Furthermore some evidence suggests that learners with lower skill levels benefit from simultaneous visual feedback.

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In contrast, the teaching mechanism in the control group was the traditional method, relying on verbal explanations from the instructor, demonstrations of the practical model, and verbal and repetitive error correction, without the use of a mirror. Both groups received the same time, content, number of attempts, and error correction in terms of frequency, but without the direct visual feedback provided by a mirror.

The organization of the training program over the six weeks was as follows:

- Week 1: Introduction to the skill and its importance, teaching the correct ready position, training on balance, direction of gaze, initial rotation of the trunk and pelvis and simple balance exercises.
- Week 2: Teaching the preparatory part of the kick, the transition from the ready position to the rotation, raising the kicking leg, and stabilizing the pivot leg with slow and segmented execution.
- Week 3: Moving on to linking rotation and kicking in a near-complete manner using a fixed and low-intensity target and focusing on the correct path of movement.
- Week 4: Perform the entire skill more smoothly with an increased number of repetitions, focusing on balance after the strike and returning to the ready position.
- Week 5: Improving accuracy and fluidity, addressing individual errors and practicing at fixed heights and distances while emphasizing control of direction and balance.
- Week 6: Consolidating skill performance, implementing the skill in a form closer to a test, gradually decreasing aids then preparing learners for the post-test.

In order to obtain the research results the data were statistically processed using the SPSS V26 program and using the laws of the arithmetic mean and standard deviation and the (t) test for related and independent samples.

Results

Table 1. *shows the means and standard deviations in the technical performance evaluation test for the back roundhouse kick to the head from the (Hajju-Jaki) movement in the pre- and post-tests for the control and experimental groups.*

Group	Unit	Pre-Test		Post-Test	
		M	Sd	M	Sd
control	Score	2.750	0.857	4.150	0.973
experimental	Score	2.700	0.888	5.000	1.291

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Table 2. *shows the difference in means, standard deviation, calculated t-value, significance of differences, and percentage change between the results of the pre- and post-tests in the technical performance evaluation test for the back roundhouse kick to the head from the (Hajju-Jaki) movement for the control and experimental groups.*

Group	Unit	D	SE Diff.	Calculated t-value	Level Error	Significance of Differences	Percentage of Change %
control	Score	1.400	0.994	4.452	0.002	Significant	50.910
experimental	Score	2.800	0.587	15.087	0.000	Significant	103.704

*Below the significance level (0.05) and degrees of freedom (9).

Table 3. *shows the arithmetic means, standard deviations, calculated t-value, error level, and significance of the differences between the two research groups in the technical performance evaluation test for the back roundhouse head kick from the (Hajju-Jaki) movement in the pre- and post-tests.*

Tests	Unit	Control Group		Experimental Group		calculated t-value	error level	significance
		Sd	D	Sd	D			
Pre	Score	2.750	0.857	2.700	0.888	0.128	0.900	Random
Post	Score	4.150	0.973	5.000	1.291	2.641	0.017	Significant

Below the significance level of (0.05) and degrees of freedom (18).

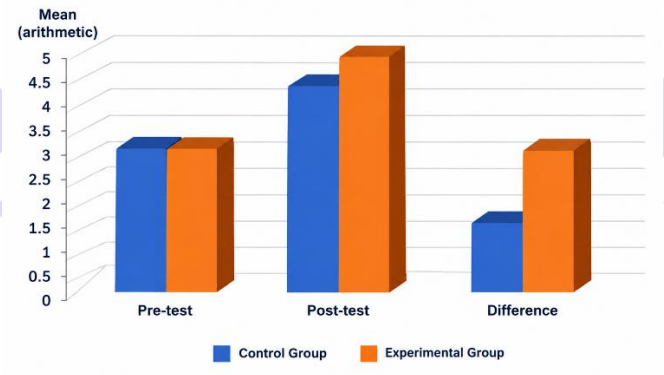


Figure 1. *shows the arithmetic means and the difference in arithmetic means between the pre- and post-test results for the experimental and control groups in the technical performance evaluation test for the back roundhouse kick to the head from the (Hajju Jaki) movement.*

Discussion

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Table (2) shows an improvement in the technical performance level of the back circular kick to the head from the movement (Hajju Jaki) among the individuals of both the experimental and control groups between the results of the pre-test and post-test, in favor of the post-test, as the arithmetic means for both groups increased. This indicates that mastery occurred in learning the skill under investigation in both groups. However the development of the experimental group that used the mirror was greater than that of its control counterpart that used traditional learning.

What confirms the superiority of the experimental group over the control group can be observed through the significant differences between the two groups in the post-test results, as the differences appeared significant in favor of the experimental group at the significance level of (0.05), knowing the randomness of the differences between the two groups in the heart test, which indicates the equivalence of the two groups and that the greatest improvement of the experimental group was due to the interference of the independent variable represented by the use of the mirror in learning the back circular kick to the head from the movement (Hajju Jaki) compared to the traditional learning used by the control group.

When learning a specific motor skill it is beneficial to receive corrective feedback on performance from the coach (Diller et al., 2022). This feedback can be about the performance itself or the outcome supporting the learner correct mistakes. While this is an important and effective method the player has no prior knowledge of the movement they performed and correcting their performance depends on the coach's advice and their own experience with the movement. Consequently learning to reach advanced levels may take a long time.

The function of the mirror in learning motor skills is to provide immediate visual feedback, which helps the learner correct their movement. The improvement observed in the experimental group can be explained by the learner's capacities to instantly improve their body positioning while performing the movement. This improvement is achieved by comparing the actual position of their body parts with the desired model which they observe from the instructor. This is particularly relevant to the trajectory of the striking leg and the rotation of the body parts—ankle, pelvis and torso—while maintaining body balance and orienting the movement toward the target. As repetition is fundamental to learning repetition combined with immediate visual correction increases the speed and quality of learning by enabling the immediate recognition and correction of errors. Therefore using a mirror empowers the learner with greater autonomy and a stronger role in the learning process through self-monitoring of movement. This enhances the learner's internal awareness and improves their kinesthetic understanding, facilitating the development of the necessary motor program for performing the movement and correcting errors.

Theoretically the development in the experimental group that used the mirror in learning can be attributed to the learner's control over his body movements and reliance on the principle of error correction through the integration between the image of the ideal

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movement model and the movement actually performed. This is something that is not provided by the traditional learning method used by the control group.

Goudini et al. (2019) indicate that feedback that can be controlled by the trainee leads to better learning outcomes and higher motivation indicators among beginner taekwondo practitioners. Visual feedback can also enhance learning by directing attention to the results of a movement through the interaction between what is demanded and what is performed (Kal et al., 2022). Furthermore, visual feedback allows the learner to identify spatial and temporal gaps in the executed movement pattern and then modify them in subsequent repetitions as well as improve pressure points and balance (Vando et al., 2021; Vando et al., 2014). The findings of the study by Han & Ji et al. (2022) indicate that visual feedback supports the learning of complex motor skills better than verbal or traditional training alone.

Conclusions

- Both the traditional method and the mirror-based learning method contributed to constructing the performance level of the back roundhouse kick to the head from the pre-test to the post-test indicating the overall effectiveness of the educational program in learning the skill.
- The experimental group that learned using the mirror reached greater improvement than the control group, suggesting that immediate visual feedback contributed to accelerating skill learning and improving execution accuracy.
- The absence of statistically significant differences between the two groups in the pre-test contrasts with the emergence of statistically significant differences in the post-test in favor of the experimental group. This reinforces the conclusion that the improvement is due to the impact of the experimental variable namely the use of the mirror and not to any prior differences between the two groups.
- The use of the mirror is an effective teaching aid in learning complex motor skills in Taekwondo especially those skills that needed high balance, rotation and precise control of body position during performance.

Recommendations

- It is recommended to incorporate mirrors into the teaching units for basic and complex Taekwondo skills particularly for younger age groups and Taekwondo learners aged 12-14 due to their role in providing direct visual feedback.
- It is recommended to equip training rooms with a suitable visual teaching aids primarily mirrors, to improve motor learning and reduce technical errors during performance.

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- Coaches and instructors are recommended to use mirrors systematically and in a planned manner within lessons integrating them with verbal explanations and practical demonstrations to achieve optimal learning outcomes.
- It is recommended to carry out further studies on other Taekwondo skills using larger samples and different age groups and incorporating additional variables such as gender, experience and learning retention, to broaden our understanding of the effect of mirrors on motor learning.

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The Role of Leadership Stability in Achieving Strategic Objectives of the National Center for Sports Talent Care

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Abstract

This study examines the significance of leadership stability in achieving the strategic objectives of the National Center for Sports Talent Development in Iraq
The research objectives to enhance a scale to measure leadership stability and the achievement of strategic objectives It also objectives to measure the level of leadership stability and the achievement of strategic objectives from the point of view of the center's employees and to study the relationship between leadership stability and the achievement of strategic objectives. The researcher used a descriptive-analytical approach with questionnaires to identify the level of leadership stability and the achievement of strategic objectives The results showed that leadership stability at the center was at a moderate level demonstrating uniformity in vision and priorities but not at an ideal level. The results also showed that the achievement of strategic objectives was between moderate and high showing the effectiveness of implementing strategic programs but with challenges in sustaining results and assigning resources The analyses showed a significant positive relationship between leadership stability and the achievement of strategic objectives highlighting the importance of leadership stability in improving the center's ability to implement its strategies. Deepening on the findings the researchers recommend strengthening leadership stability and allocating resources more effectively to ensure the sustainability of the sports programs' find.

Keywords: Leadership stability, strategic objectives, National Center for Sports Talent Care.

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Introduction

Sports organizations are among the fields that needed effective leadership to achieve defined strategic goals Leadership stability has proven to be a key factor in enhancing organizational performance and ensuring the long-term sustainability of results In this context the significance of leadership stability is highlighted at the National Center for Sports Talent Development in Iraq essential center working to improve athletic talent throughout many disciplines.

Sports institutions in Iraq encounter significant obstacles due to the volatile environment in which they operate, comprising policy changes, economic obstacles and administrative shifts. These challenges necessitate leadership consistency to ensure the achievement of long-term strategic goals This research aims to examine the role of leadership stability in achieving the strategic objectives of the National Center for Sports Talent improvement by exploring the relationship between leadership stability and the effectiveness of strategic program implementation at this center.

Leadership stability is one of the most significance factors affecting the success or failure of long-term strategies in sports organizations. Stable leadership enhances clarity of vision, facilitates strategic decision-making and contributes to enhance administrative and athletic performance. Available literature indicates that strategic leadership directly impacts the outcomes of sports programs at the organizational level (Hoye et al., 2015). Furthermore a study by Petković et al. (2016) confirmed that leadership stability assists achieve positive long-term athletic results by optimizing resource allocation and integrating strategic programs.

although the significant importance of leadership stability there is a gap in the literature regarding how to measure its impact on achieving strategic goals in Iraqi sports institutions. Therefore this research aims to develop a scale to measure leadership stability and identify its impact on achieving the strategic goals of the National Center for Sports Talent Development.

Prior studies have supported this significance such as Jabbar & Hussein's (2017) study which examined the impact of strategic leadership on organizational performance in sports demonstrating that stable leadership significantly promotes to improving the effectiveness of strategic implementation. Furthermore Naji's (2024) study provided a detailed analysis of strategic leadership among heads of sports federations in Iraq indicating the strong relationship between effective leadership and the ability to achieve sporting goals Ahmed (2024) also stressed the significance of an empowering leadership style in enhancing organizational control within sports clubs.

The significance of this research rooted in many scientific and practical considerations most notably its scientific significance. The research contributes to enriching the literature on sports management by linking the constract of leadership stability to the output of strategic implementation in sports organizations especially talent development

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institutions which needed continuity and institutional growth. This corresponds with what sports management literature emphasizes: that leadership and strategic planning constitute the core of the administrative process within sports organizations. (Hoye et al., 2015)

In addition to its practical importance the research supplies actionable indicators that can benefit decision-makers at the National Center and supervisory bodies when designing leadership appointment policies, defining term limits band documenting procedures to ensure that programs are not disrupted or their paths modified by personnel changes. It can also contribute to enhancing consistency between plans, resources, monitoring and decreasing waste resulting from restarting or changing priorities without clear institutional justification.

Research Problem:

Common leadership changes and variations are among the most significant causes of inconsistencies in administrative approaches, shifts in priorities and allocations in policies and procedures. This adversely affects the accumulation of institutional experience the stability of work teams and the characteristic of talent development programs. Therefore the research issue arises from the absence of a precise scientific picture of the level of leadership stability at the National Center for Sports Talent Development and its contribution to achieving the center's strategic objectives from the perspective of employees at all administrative levels. Hence this research objectives to answer the central question: To what range does leadership stability contribute to achieving the strategic objectives of the National Center for Sports Talent Development?

Research Objectives

1. To improve a scale to measure leadership stability at the National Center for Sports Talent Development in Iraq from the perspective of the center's staff (coaches and administrators).
2. To develop a scale to measure the level of achievement of strategic goals at the National Center for Sports Talent Development in Iraq from the perspective of the center's staff (coaches and administrators).
3. To measure the level of leadership stability from the perspective of the center's staff (coaches and administrators).
4. To measure the level of achievement of strategic goals at the National Center for Sports Talent Development in Iraq from the perspective of the center's staff (coaches and administrators).
5. To explain the nature of the relationship and effect of leadership stability at the National Center for Sports Talent Development in Iraq on the achievement of the institution's strategic goals.

Research Scope:

- Human Scope: The study's human scope is restricted to senior administrative leaders as the target sample and the staff of the National Center for Sports Talent Development in Baghdad and the provinces (coaches and administrators) constitute the main research

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sample. The scale will be implemented to them as they are the groups most closely associated to the research problem.

- Temporal Scope: From October 2, 2025, to February 26, 2026.
- Spatial Scope: The headquarters of the National Center for Sports Talent Development in Baghdad and the provinces within the Republic of Iraq.

Search procedures

Research methodology:

The researchers used the descriptive method with its survey and correlational relationships, because it appropriate the nature of the research problem.

Research community and sample:

The research community comprises of 13 main multi-sports centers in Baghdad in addition to 68 branches of these centers in various Iraqi governorates. The research sample contains 243 affiliates, including coaches and administrative staff from these specialized sports centers.

The research sample was selected to include 211 participants, representing 86.8% of the research population. The sample identified of 37 department managers and 174 trainers. Of this sample, 196 forms were found to be valid for statistical analysis, representing 92.8% of the recruited sample.

The pilot study sample consisted of 6 participants, representing 3% of the total sample while 114 participants were selected for the construction sample representing 58.1% of the total sample. The application sample consist of 76 participants, or 38.7% of the total sample.

Search tools

Steps for building the two research scales

To achieve the aims of this research two specialized scales were needed to measure leadership stability and the achievement of strategic goals. This was crucial cause there were no readily available, standardized scales suitable for the organizational environment of the National Center for Sports Talent Development and the Iraqi Ministry of Youth and Sports and suitable to the research variables and objectives. Accordingly the researchers improved the two scales following established scientific steps in specialized sports management research based on the work of Al-Kinani and Jabbar (1995, p. 138). These steps included defining the objectives and scope of each scale, practically defining the concepts to be measured, analyzing the measurement field identifying suitable areas and items, formulating the scale items and instructions and then submitting them to a panel of experts for review and necessary revisions based on their feedback.

A theoretical definition of leadership stability was implemented describing it as the leadership's ability to maintain continuous strategic direction for the organization while confirming that policies and decisions align with the organization's strategic objectives. This is achieved through vision consistency continuity of priorities and policy clarity. Based on this concept a leadership stability scale was developed, comprising three main areas: vision

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consistency, precedence continuity and policy clarity. Each constituent is operationally measured based on the clarity of the leadership vision and the availability of continuous direction for the organization.

The concept of attaining strategic objectives was defined as the center's success in implementing its strategic programs and achieving its set goals based on the adequate allocation of resources to ensure sustainability and the achievement of results. Accordingly, the strategic objectives achievement scale was developed based on three areas: (program implementation, resource allocation, and results sustainability) with each component measured based on the availability of resources to support programs and achieve sustainable results.

After drafting the initial dimensions and items for the two scales they were presented to seven experts and specialists in sports management, measurement and evaluation via a survey form to verify their suitability and adequacy for the research objectives. Following the compilation and analysis of the surveys the domains and items that received 80% or higher approval were adopted. The statements were then adjusted based on the experts' feedback without altering the core of the scales. Eighteen out of the nineteen recommended statements for the Leadership Stability scale were accepted by the experts, and sixteen out of the eighteen proposed statements for the Strategic Goal Achievement scale were approved by the experts.

Based on this procedure, two measures were improved that are appropriate for the target community in the research to be applied on (30/7/2025).

Apparent truthfulness:

The researchers implemented face validity to verify the suitability of the items in the leadership stability and strategic goal achievement scales for measuring the research variables. Face validity is a crucial indicator in test and scale construction, as it relates to the clarity, validity and representativeness of the feature being measured according to experts. This was achieved by presenting the scale items to a group of experts and referees in sports management and adopting an agreement rate of 80% or higher as the acceptance criterion based on the methodological literature associated to scale construction.

The discriminatory power of the items in the two scales:

Since the present research measures the level of leadership stability and achievement of strategic goals at the National Center for Sports Talent Development the availability of this attribute means that the items are able to precisely distinguish between sample members who have high and low levels of response in both leadership stability and achievement of strategic goals.

To establish this the sample questionnaires were organized in descending order according to their total score. Then, a two-group approach was adopted identifying the highest (27%) and lowest (27%) questionnaires to form two groups representing the extremes of the distribution, totaling (24) questionnaires. The middle group, comprising (66) questionnaires, was excluded from this procedure. After identifying the two groups, a

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t-test was used to contrast the means. The results showed significant differences at the (0.05) level with (46) degrees of freedom, revealing that the items on the leadership stability and strategic goal achievement scales possess implemented discriminatory power and can be relied upon in the final application.

Table1. shows the discriminative ability of the items of the Leadership Stability Scale.

Item	Total	Mean	Standard deviation	Value (T)	(Sig)	Significance
1	upper	4.3	0.463	12.943	0.000	Significant
	lower	2.2	1.05			
2	upper	4.34	0.479	14.56	0.000	Significant
	lower	2.32	0.844			
3	upper	4.32	0.471	18.012	0.000	Significant
	lower	2.36	0.827			
4	upper	4.78	0.418	12.835	0.000	Significant
	lower	2.28	0.834			
5	upper	4.72	0.454	10.277	0.000	Significant
	lower	2.26	0.853			
6	upper	4.26	0.694	12.889	0.000	Significant
	lower	1.42	0.673			
7	upper	4	0.535	13.416	0.000	Significant
	lower	1.38	0.635			
8	upper	4.3	0.707	13.74	0.000	Significant
	lower	1.38	0.667			
9	upper	4.34	0.717	15.782	0.000	Significant
	lower	1.4	0.7			
10	upper	4.04	0.57	13.45	0.000	Significant
	lower	1.66	0.717			
11	upper	4.02	0.553	20.397	0.000	Significant
	lower	2.04	0.533			
12	upper	4.36	0.722	17.978	0.000	Significant
	lower	2.04	0.57			
13	upper	4.38	0.725	19.879	0.000	Significant
	lower	2.04	0.605			
14	upper	4.06	0.586	19.523	0.000	Significant
	Lower	2.04	0.638			
15	upper	4.28	0.701	18.86	0.000	Significant
	lower	2.04	1.009			
16	upper	4.32	0.713	16.358	0.000	Significant
	lower	2.48	0.886			
17	upper	4.2	0.67	13.852	0.000	Significant
	lower	1.88	0.746			
18	Upper	4.18	0.661	13.45	0.000	Significant
	lower	2.16	0.792			

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At the significance level of 0.05 and with a degree of freedom of $(n_1 + n_2 - 2) = 46$, an item is

considered discriminative if its calculated t-value is statistically significant (Sig) ≥ (0.05)

Table2. shows the discriminative power of the items of the Strategic Goal Achievement Scale

Item	Total	Mean	Standard deviation	Value (T)	(Sig)	Significance
1	Upper	4.16	0.65	20.999	0.000	Significant
	lower	1.66	0.745			
2	Upper	4.34	0.717	18.104	0.000	Significant
	lower	1.66	0.772			
3	Upper	4.44	0.733	18.022	0.000	Significant
	lower	1.56	0.705			
4	Upper	4.56	0.733	19.776	0.000	Significant
	lower	1.8	0.7			
5	Upper	4.5	0.735	19.584	0.000	Significant
	lower	1.84	0.468			
6	Upper	4.46	0.734	21.776	0.000	Significant
	lower	1.88	0.558			
7	Upper	4.14	0.639	17.872	0.000	Significant
	lower	1.5	0.707			
8	Upper	4.18	0.691	17.979	0.000	Significant
	lower	1.32	0.621			
9	Upper	4.16	0.65	10.936	0.000	Significant
	lower	1.5	0.678			
10	Upper	4.52	0.735	10.496	0.000	Significant
	lower	1.54	0.734			
11	Upper	4.1	0.614	19.944	0.000	Significant
	lower	1.68	0.713			
12	Upper	4.08	0.601	21.803	0.000	Significant
	lower	2.06	0.512			
13	Upper	4.38	0.725	20.653	0.000	Significant
	lower	2.06	0.55			
14	Upper	4.42	0.731	20.728	0.000	Significant
	lower	2.06	0.586			
15	Upper	4.14	0.639	18.187	0.000	Significant
	lower	2.06	0.62			
16	Upper	4.42	0.785	18.104	0.000	Significant
	lower	1.82	0.388			

At the significance level of 0.05 and with a degree of freedom of $(n_1 + n_2 - 2) = 46$, an item is

Considered discriminative if its calculated t-value is statistically significant (Sig) ≥ (0.05)

Internal Consistency Coefficient (Internal Consistency Validity):

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The internal consistency validity of the items on the Leadership Stability and Strategic Goal Achievement scales was confirmed by calculating the simple correlation coefficient between the score of each item and the total score of the scale to which it belongs. Pearson's correlation coefficient was used based on the responses of a construct sample of 114 questionnaires. The results demonstrated that a number of items were not statistically significant as their significance level exceeded 0.05; there fore they were omitted from the scale. Accordingly the modified scale consists of 15 items for the Leadership Stability scale and 15 items for the Strategic Goal Achievement scale. Tables 3 and 4 show the correlation coefficients and their statistical significance for the items.

Table3. shows the internal consistency of the items of the Leadership Stability Scale

Item	Correlation with the total score of the scale	Significance	Item	Correlation with the total score of the scale	Significance
1	0.358	0.000	10	0.380	0.000
2	0.224	0.002	11	0.370	0.000
3	0.295	0.000	12	0.457	0.001
4	0.282	0.004	13	0.349	0.000
5	0.256	0.000	14	0.429	0.000
6	0.445	0.000	15	0.560	0.000
7	0.458	0.026	16	0.212	0.016
8	0.310	0.001	17	0.224	0.018
9	0.419	0.000	18	0.571	0.000

Table4. shows the internal consistency of the items of the Strategic Goal Achievement Scale

Significance	Correlation with the total score of the scale	Item	Significance	Correlation with the total score of the scale	Item
0.001	0.583	9	0.000	0.899	1
0.000	0.852	10	0.000	0.852	2
0.000	0.827	11	0.000	0.911	3
0.000	0.775	12	0.000	0.862	4
0.000	0.859	13	0.003	0.411	5
0.001	0.634	14	0.000	0.744	6
0.016	0.383	15	0.000	0.646	7
0.000	0.666	16	0.000	0.687	8

Table5. Shows the consistency of the domains of the two scales with the total scores of the two scales.

Strategic Goal Achievement Scale	Leadership Stability Scale

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Significance of the Correlation	(Sig)	Correlation Coefficient (r) Between the Domain Total Score and the Scale Total Score	Domains	Significance of the Correlation	(Sig)	Correlation Coefficient (r) Between the Domain Total Score and the Scale Total Score	Domains
Significant	0.000	0.933	Program achievement	Significant	0.000	0.589	Vision consistency
Significant	0.000	0.671	Resource allocation	Significant	0.000	0.644	Priority continuity
Significant	0.000	0.643	Sustainability of results	Significant	0.000	0.808	Policy clarity

Reliability of the Two Scales

The reliability of the two scales was verified using Cronbach's alpha coefficient on the statistical analysis sample. The results demonstrate that the reliability coefficient for the Leadership Stability Scale was (0.817), and for the Strategic Goals Achievement Scale it was (0.780). These values are within acceptable limits in scientific research, revealing that the two scales possess adequate reliability and are appropriate for field application and results analysis.

Application of the Two Scales to the Final Application Sample

After finalizing the versions of both the Leadership Stability Scale (15 items) and the Strategic Goals Achievement Scale (15 items) the researchers employed them to the final application sample selected from the main research sample of (196) employees at the National Center for Sports Talent Development. The application was implemented between October 10, 2025, and January 23, 2026.

Presentation and Discussion of Results

Presenting the results of the first objective, which included "Developing a leadership stability scale for the National Center for Sports Talent Development." This aim was achieved by finalizing the scale.

Presenting the results of the second objective, which involved "Developing a scale to measure the level of achievement of strategic goals at the National Center for Sports Talent Development in Iraq from the perspective of the center's staff (coaches and administrators)." This objective was also achieved by finalizing the scale.

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Before presenting the results of the third objective the levels of the leadership stability questionnaire were analyzed and defined. Tables (6) and (7) detail the questionnaire levels and their respective items.

Table6. shows the domains and levels measured in the Leadership Stability Scale.

Domain	Level	Rank
Domain 1	low	35-15
Domain 2	medium	55-36
Domain 3	high	75-56

Table7. shows the domains and levels of the items of the Leadership Stability Scale.

Domain	Level	Rank
Domain1	low	-12.33
Domain 2	medium	2.34-3.67
Domain 3	high	3.685-

Presentation and Discussion of the Results of the Third Objective, which aimed to identify the
level of leadership stability from the perspective of the center's staff (coaches and administrators). The researchers obtained the following results:

Table8. shows the means and levels of the items of the Leadership Stability Questionnaire.

Level	Mean	Item	Level	Mean	Item
Low	2.30	9	medium	3.30	1
Low	2.33	10	medium	3.37	2
medium	3.19	11	medium	2.92	3
medium	3.20	12	medium	3.48	4
Low	2.32	13	medium	3.56	5
medium	3.55	14	medium	3.62	6
medium	3.46	15	medium	3.18	7
medium	3.46	16	medium	3.45	8

Discussion of the results of the third objective: Level of leadership stability

The results of the third objective demonstrate that the level of leadership stability at the National Center for Sports Talent Development is at an average level. This means that staff regard a degree of consistency in vision, relative continuity in priorities band acceptable clarity in policies. However this perception has not yet reached the high level that reflects a complete organizational entrenchment of these dimensions. This indicates that the center possesses an effective leadership base that allows for continued operation but it still needs further institutionalization and consolidation for leadership stability to convert from an acceptable administrative practice into a firmly established organizational characteristic.

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This result can be explained by the nature of sports talent development organizations which depended on long-term programs that begin with selection then development monitoring and evaluation. Therefore staff are more responsive to any fluctuations in priorities or the clarity of leadership directives. This explanation corresponds with what Hoye et al. (2015) emphasized: that leadership in sports organizations is not limited to managing day-to-day operations but also involves directing resources building a vision and ensuring its translation into measurable results. It also echoes Ireland and Hitt's view that strategic leadership plays a primary role in maintaining competitiveness and sustainability by stabilizing the organization's overall direction and integrating decisions to long-term goals (Ireland & Hitt, 1999).

The recent findings appear to align with the direction of Radhi and Wahab's (2023) study which demonstrated that administrative adaptability in the Iraqi sports environment still needs greater clarity in objectives, planning and collaboration This indirectly suggests that administrative and leadership stability in many sports institutions remains at a level that can be improved rather than at full maturity It also coincides with Ahmed and Abdul-Khaliq's (2023) study which established that effective leadership styles are positively correlated with the work output of Ministry of Youth and Sports employees This suggests that consistent and clear directives can enhance performance and job creativity within sports institutions.

In the other hand the fact that some items on the scale retain at a low level indicates that leadership stability is not uniform across all its components The shortcomings may be concentrated in aspects related to the continuity of priorities or the clarity of operational policies for employees This understanding is strengthened by what Jabbar (2017) and Hussein argued: that leadership represents the link between vision, strategy and implementation and that weakness in this role directly impacts the quality of implementation and the stability of organizational performance This finding can also be linked to the conclusion reached by Danylchuk and Doherty (1996), who found that transformational leadership in sports contexts is related with more positive organizational outcomes compared to less effective styles This highlights the significance of clear and encouraging leadership as a framework that supports stability within the organization.

Studies by Hazza and Qusay (2018a, 2018b) in the field of change management can also be utilized. They indicate that Iraqi sports institutions may possess a positive capacity to deal with change, but this change is more effective when it operates within a structured and clear administrative framework. Leadership stability here does not mean resisting development, but rather guiding its course and preventing it from descending into confusion or shifting directions. Furthermore, the study by Talib, Qusay, and Khamis (2019) suggests that management training contributes to raising the efficiency of administrative staff which supports the notion that leadership stability can be enhanced by developing leaders and staff on standardized professional foundations.

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The results demonstrated an acceptable administrative structure upon which to build but it needs more development through documenting strategic priorities explaining administrative roles establishing policies and engaging employees more broadly in understanding the center's leadership direction In this sense the average level does not represent a critical weakness but rather clearly indicates a real chance for improvement if properly leveraged institutionally.

Presenting and discussing the findings of the fourth objective (measuring the level of achievement of strategic goals at the National Center for Sports Talent Development in Iraq from the perspective of the center's staff (coaches, administrators)).

Presentation and Discussion of the Results of the Fourth Objective

The fourth objective aimed to measure the level of strategic goal achievement at the National Center for the Care of Sports Talent in Iraq from the perspective of the center's staff (coaches and administrators). The researchers obtained the following results:

Table9. present the domain and levels of the strategic goal achievement scale.

Domain	Level	Rank
Domain1	low	35-15
Domain2	moderate	55-36
Domain3	high	75-56

Table 10. present the domains and level of the items of the strategic goal achievement scale.

Domain	Level	Rank
Domain1	low	-12.33
Domain2	moderate	2.34-3.67
Domain3	high	3.685-

Table 11. present the mean scores and levels of the items of the strategic goal achievement scale

level	Mean	Item	Level	Mean	Item
moderate	3.47	9	moderate	3.11	1
moderate	3.26	10	high	3.72	2
high	3.69	11	moderate	3.49	3
moderate	3.51	12	moderate	3.45	4
moderate	3.56	13	high	3.74	5
moderate	3.18	14	moderate	3.22	6
moderate	3.63	15	high	3.72	7
moderate			high	3.71	8

Discussion of the results of the fourth objective: Level of achievement of strategic goals

The findings of the fourth objective showed that the level of achievement of strategic goals at the National Center for Sports Talent Development varied between average and high. This result reveals authentic operational effectiveness within the center but it also reflects disparities in the different aspects of goal achievement specially those connect to program implementation resource allocation and the sustainability of results This

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demonstrates that the center is not operating in an administrative vacuum rather it is achieving a significant portion of its objectives but it has not yet reached a high and balanced level of achievement across all aspects.

This finding can be interpreted by the fact that sports talent development organizations often achieve more evident progress in aspects related to the implementation of daily or seasonal programs while facing related challenges in areas requiring long-term institutional coordination such as aligning resources with objectives sustaining results and linking planning with continuous evaluation**.** This consistent with Petković et al. (2016) who claimed that the value of strategic planning in sports organizations is not rooted only in setting objectives but also in linking analysis implementation, monitoring and feedback. It also corresponds with Ilić (2013) who described strategic planning in sports organizations as an active process based on defining the mission analyzing the situation developing strategies, monitoring implementation and modifying priorities as needed.

The current finding gains further interpretive power when compared to the study by Abdul Wahid (2018) on the National Center for Sports Talent Development. That study showed that the center's strategic planning is characterized by a focus on objectives and their formulation but requires strengthening in environmental analysis information updating employee engagement and periodic plan review This aligns with the current finding as achieving a moderate to high level of strategic objective attainment suggests that the center possesses an existing planning and implementation framework but has not yet reached full institutional maturity.

This interpretation can also be supported by the findings of Martínez-Moreno (2021), who concluded that leadership style in sports clubs is tide to strategic management and employee effectiveness and satisfaction. This suggests that achieving goals within sports organizations depends not only on the existence of written plans but also on the nature of the leadership adopted by the organization in directing resources, motivating employees and organizing collective effort. This idea also aligns with what Frontiera (2010) demonstrated: that leadership in professional sports influences organizational culture and the organization's ability to transform and adapt which is indicated in overall performance and the continuity of operational directions.

moreover the presence of some items at the high level indicates that the center is clearly succeeding in certain aspects perhaps reflecting the availability of effective programs accumulated expertise, or stable implementation procedures in specific areas However the continued presence of the remaining items at the medium level means that achieving the strategic objectives still needs greater integration between administrative units and branches as well as developed resource allocation and monitoring mechanisms. This aligns with the conclusion of Cairney Richard, and Legg (2024) that effective sports leadership requires a blend of vision, meaning-making, decision-making and the development of structures and processes that create the conditions for success within complex organizations. Therefore the current results do not indicate a weakness in the center's ability to achieve its

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objectives but rather a positive level with potential for improvement. This means that the priority in the next phase is not to reformulate the objectives, but rather to improve the efficiency of their implementation, strengthen their sustainability and improve the link between planning, resources, evaluation and monitoring.

The findings of the fifth objective (studying the nature of the relationship and effective of leadership stability in the National Center for Sports Talent improvement in Iraq on achieving the strategic goals of this institution) were showed and discussed. The researchers reached the following conclusions:

Table 12. presents the summary of the simple linear regression model for the variables of Leadership Stability and Strategic Goal Achievement.

Dependent variable	Independent Dependent variable	Correlation variable	Coefficient of Determination (R^2)	Computed F-value	Significance
Strategic goal achievement	Leadership stability	0.625	0.391	46.231	0.000

Discussion of the results of the fifth objective: The relationship and impact between leadership stability and achieving strategic goals

The results of the fifth objective revealed a statistically significant positive correlation between leadership stability and the achievement of strategic goals. Furthermore the regression analysis demonstrate a significant effect of leadership stability in explaining an important aspect of the level of strategic goal achievement. This finding indicates that leadership stability is not a secondary organizational element but rather a key factor influencing the efficiency of strategic achievement within the National Center for Sports Talent Development. The more consistent the leadership's vision the more consistent its priorities and the clearer its policies, the greater the organization's capacity to translate its objectives into more stable and sustainable practical outcomes.

This result is logical given the nature of the center itself as sports talent development programs rely on cumulative time, systematic monitoring, and consistency between selection, development and evaluation—processes that are rapidly affected if leadership undergoes frequent changes or sharp shifts in priorities. Therefore the positive relationship between the two variables is not solely a statistical correlation but reflects an actual organizational mechanism through which we can understand how leadership stability contributes to improving an organization's strategic execution ability.

This finding aligns with the results of Ahmed and Abdulkhaliq (2023) who confirmed a positive relationship between transformational leadership and creativity in the job performance of Ministry of Youth and Sports employees. Both studies confirm that effective leadership finally impacts the quality of organizational outcomes**.** Furthermore it corroborates the result of Burton and Peachey (2009) who demonstrated that transformational leadership is related with more positive organizational outcomes in sports management, particularly in terms of satisfaction effectiveness and extra effort—indicators that are functionally aligned with the ability to achieve strategic goals within the organization.

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This finding also verifies the findings of Liu et al. (2024) in Ethiopian sports organizations which demonstrated that leadership styles directly impact employee performance and that more positive leadership styles are connect with better job satisfaction and organizational performance. In spite of variations in organizational environments the core finding remains consistent: clear and supportive leadership optimal guides collective effort and enhances an organization's ability to achieve its goals. Furthermore Martínez-Moreno et al. (2021) concluded that leadership within sports clubs is a key element of strategic management, verifying that leadership is not a behavioral issue separate from outcomes but rather an integral part of the explanatory framework for organizational performance.

The result reached by the current research is consistent with the results of research in the Iraqi sports environment. Through the study of Radhi and Wahab (2023) on administrative flexibility and through the studies of Qusay and his colleagues on change management and administrative training these studies collectively reveal that Iraqi sports institutions are clearly affected by the management and leadership style, the method of organizing human resources and the direction of work. When the leadership is stable, change becomes more disciplined, administrative training becomes more capable of establishing standard and the institution becomes more effective of investing its resources towards specific and agreed-upon goals.

However the fact that leadership stability does not demonstrate all the variation in achieving strategic goals indicates that strategic achievement is not solely dependent on this factor but is also influenced by other factors such as human and material resources, information systems coordination mechanisms the level of managerial qualifications and the nature of the organizational environment in which the center operates. This aligns with what the strategic literature in sports and management generally emphasizes: that achieving results is the product of the interaction of several components within the organization not the result of a single variable. In this context Cairney et al. (2024) argue that effective sports leadership operates within a network of roles, capabilities and structures while Ireland and Hitt (1999) assert that strategic leadership maintains competitiveness by combining overall direction, resource investment and environmental adaptation.

Therefore the most important practical value of this finding depend on the clear scientific justification it provides for decision-makers at the National Center for Sports Talent Development to prioritize leadership stability as a key enabler for achieving strategic goals. Enhancing leadership stability by solidifying priorities, documenting policies, fostering greater clarity of vision and developing leadership competence can improve the efficiency of strategic implementation and make the center's outcomes more consistent and sustainable in the medium and long term.

Conclusions:

1. It seems that leadership stability at the National Center for Sports Talent Development is at an average level. This means there is acceptable consistency in vision and relative continuity in priorities but this stability has not reached the ideal level needed to achieve sustainable organizational results.
2. There endures a lack of complete consistency in some dimensions such as policy clarity and continuity of priorities which affects the effectiveness of strategic implementation.
3. While the National Center for Sports Talent Development is making some advancement in implementing sports programs and allocating resources there is still a gap in sustaining results and aligning resources with long-term goals.

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4. The results presented that there is a disparity between the different aspects in achieving the strategic goals as some dimensions recorded high results and others remained at average levels.

5. A strong and positive relationship was found between leadership stability and the achievement of strategic goals as the analysis showed that leadership stability in the center contributes significantly to improving the center's ability to achieve its strategic goals.

Recommendations:

1. The center should work on documenting and establishing its priorities and strategies to guarantee continuity of leadership and policy control which will help decrease administrative fluctuations and increase the sustainability of programs.

2. Transparency of policies and procedures should be enhanced including clearly defining administrative roles to maintain consistency between leadership and staff at the center.

3. More financial and human resources must be allocated to ensure the sustainability of sports programs as well as better integration of resources and strategies to achieve long-term goals.

4. The need to improve leadership skills through specialized training programs that focus on developing administrative and technical capabilities which promotes leadership stability and makes institutional performance more efficient.

5. Working to enhance communication channels between management and employees and enhancing participation in decision-making, which contributes to improving interaction between different administrative levels in the center.

6. Continuous monitoring and strategic evaluation efforts should be intensified to ensure that aimed are achieved and programs and policies are updated based on field observations and changes in the sports environment.

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