



The Effect of Tactical Exercises Based on Maximal Aerobic Capacity on Developing Some Physical Abilities and Fast Offensive Transition in Youth Basketball Players

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Abstract

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

Keywords: Tactical drills, aerobic power, fast offensive transition

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Introduction

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

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

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

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

Basketball is a team sport where combined performance from physical, technical and tactical points of view are needed. The players must have an excellent aerobic and anaerobic capacity to undertake defensive and offensive tasks optimally during the match. Aerobic fitness is an important factor in the ability of a player to sustain effort, and move rapidly without fatigue from defending moves on principle involved in attack.

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

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

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

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

Research Objectives

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



Research Hypotheses

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

Research Scope

Human Scope: (12) youth basketball players.

Time Scope: From 6/8/2025 to 29/9/2025.

Spatial Scope: Baghdad.

Research Methodology and Field Procedures

Research Method:

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

Population and Sample

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

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

Data Collection, Devices, and Tools Used

1. Observation and experimentation.

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

Test of the study

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

Purpose of the test: To measure maximal transitional speed.

Equipment: Stopwatch and whistle.

Two parallel lines are marked 30 meters apart; the first represents the starting line and the second the finish line.

Performance description:

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

Performance conditions

Multiple players do the test at once to keep it competitive

Recording method

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

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

Equipment: Five poles and a stopwatch.



Test setup

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

Procedures

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

Recording

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

Research Methodology and Field Procedures

Research Method

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

Research Population and Sample

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

The sample was randomly distributed into two equal groups, an experimental group (6) players and a control group (6) players under the age of 16. The sample population was consistent with the target research population as per study objectives.

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

Means of Data Collection

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

Measurement and Tests

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

Purpose of the test: To measure maximal transitional speed.

Equipment: Stopwatch and whistle.

Two parallel lines are marked 30 meters apart; the first represents the starting line and the second the finish line.

Performance description

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

Performance conditions

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

Recording method

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

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

Equipment: Five poles and a stopwatch.

Test setup

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

Procedures

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

Recording

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

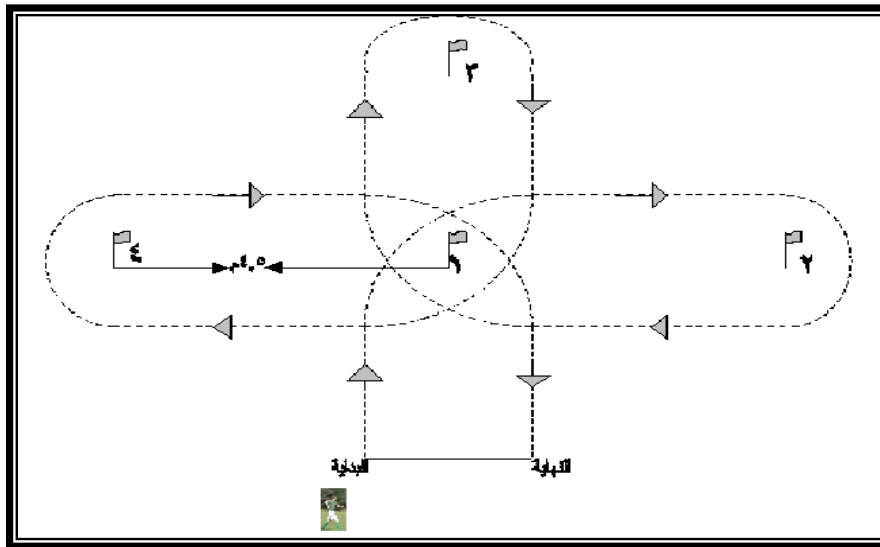


Figure 1. illustrates the agility test.

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

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

Performance description

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

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

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

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

Equipment used

- Standard basketball court
- Two basketballs
- Stopwatch
- Whistle
- Cones to mark distances
- Recording sheet for attempts and points

Test procedures

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

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

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

Scoring

- One point is awarded for each completed cycle.



- Half a point is awarded for each successful shot.
 - Final score = total points accumulated during 3 minutes.
- The test is repeated twice, and the best score is recorded.

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

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

Required equipment

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

Test procedures

The player is on the baseline with the ball in hand. As the start signal is given, the player sprints at full speed towards the opposite basket (around 28 m) The player will then pass it to a wall or teammate at midcourt, get the ball back and run towards the basket for an open lay-up shot right after.

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

Recording method

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

Procedures

Pilot Study

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

Pre-tests

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

Normal Distribution of the Sample

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

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

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

Equivalence Between the Two Groups

One of the requirements of the experimental design for this study was to determine the baseline equivalence between the two research groups in the pre-tests. Therefore, the researcher used the independent samples t-test to identify the equivalence between the experimental and control groups, as shown in Table (2).

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

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

Main Experiment

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

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

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

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

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

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

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

Example: 2 minutes effort / 2 minutes rest or 1.5 minutes rest.

Post-tests

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

Statistical Methods

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

Results

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

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

Test	Group	Pre-test Mean	SD	Post-test Mean	SD	F value	df	Calculated t	Error Level	Significance
30 m Speed	Experimental	4.3167	0.07312	4.0917	0.02927	0.225	0.047	11.568	0.000	Significant
	Control	4.3367	0.05046	4.2300	0.04195	0.106	0.055	4.749	0.005	Significant
Explosive Strength	Experimental	36.166	1.1690	41.333	1.6329	5.166	1.471	8.598	0.000	Significant
	Control	35.500	1.5165	37.666	0.81650	2.166	1.471	3.606	0.015	Significant
Agility	Experimental	16.108	0.06080	15.518	0.03061	0.590	0.042	33.691	0.000	Significant
	Control	16.120	0.06542	15.891	0.24103	0.228	0.211	2.605	0.000	Significant
Specific Endurance	Experimental	6.7167	0.54924	8.0167	0.42622	1.3	0.414	7.678	0.046	Significant
	Control	6.550	0.524	7.2167	0.24014	0.666	0.344	4.740	0.005	Significant
Fast Break	Experimental	9.1167	0.11690	8.4500	0.04243	0.666	0.119	13.672	0.000	Significant
	Control	9.1883	0.11974	8.6883	0.24236	5.00	0.21	5.831	0.002	Significant

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

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

Discussion

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

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

One of the main reasons for this development is the integration of physical and tactical components within a single training unit. Training was not limited to developing speed or endurance in isolation from tactical situations; instead, these abilities were employed to serve direct tactical objectives, such as rapid transition from defense to offense. This integration enhanced neuromuscular efficiency and motor coordination, which is consistent with the findings of Sheppard and Young (2006), who indicated that combining motor skills with tactical situations contributes to the development of agility and neuromuscular coordination more effectively than traditional isolated training methods (Sheppard & Young, 2006, pp. 919–932).



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

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

Conclusions

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

Recommendations

1. Tactical exercise based on maximal aerobic capacity should be integrated into youth basketball training programs.
2. There should be focus on the incorporation of physical training within the tactical plans, which will help maximize players' overall performance.
3. As a result, increased intensity of training load must be applied in a progressive fashion to facilitate physiological adaptations of the muscles and minimize muscular fatigue.
4. Increased use of a high-intensity intermittent training approach is advised to improve specific endurance and performance in rapid transitions.
5. We recommend conducting the same studies on different age groups and performance levels.



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