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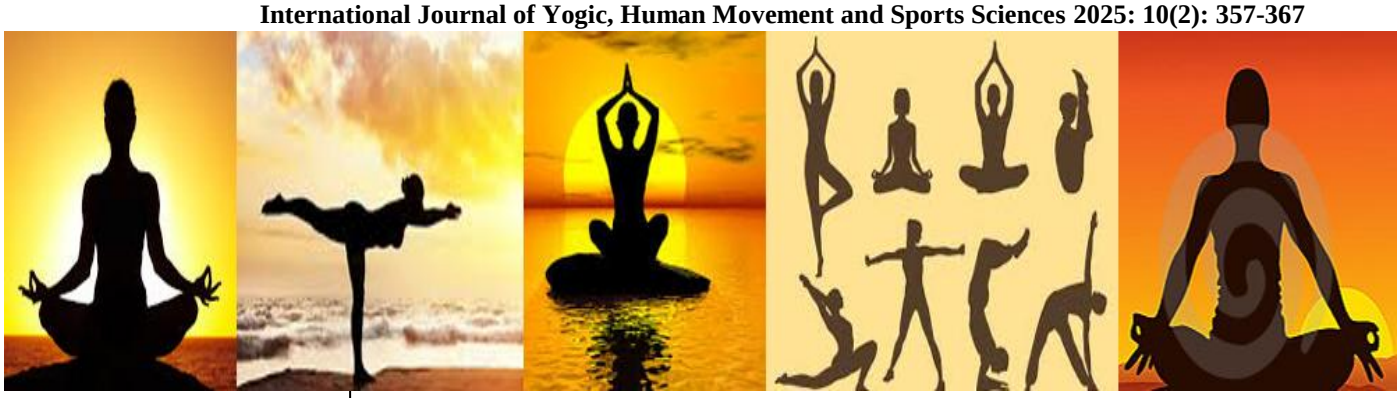

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The effect of functional exercises using the MetCon method on short-term anaerobic capacity, reaction speed, agility, and offensive and defensive follow-up skills in under-18 basketball players

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Abstract
Objective: Develop functional exercises using the metabolic conditioning (MetCon) method for basketball, and identify the effect of functional exercises using the metabolic conditioning (MetCon) method on anaerobic capacity, reaction speed, agility, and offensive and defensive follow-through of youth basketball players.
Methodology: For research with a similar experimental and control group design, including pre- and post-tests, the researcher used the experimental technique. The Al-Hilla Sports Club's twenty-four young basketball players under the age of eighteen comprised the research community. A thorough census was used to choose the research sample, and a random lottery method was used to divide them up. The players' names were written on similar papers, which were then closed in the same manner and put in a box. The names were then drawn, and 12 players were placed in the experimental group and the remaining 12 in the control group.
Outcomes: Pre- and post-test findings showed statistically significant differences between the experimental and control groups. The researcher is of the opinion that the significant differences observed are the result of the various training methods and techniques used and applied by the coach to the players. Also, the number of repetitions that the control group members participated in, and their continued participation in sports training, results in functional adaptations at some rate. All these reasons account for these significant differences.
Conclusions: There were statistically significant variations in the experimental group's pre- and post-test scores on the variables under investigation, suggesting that the particular physical activities employed were successful in fostering anaerobic capacity among the players in the experimental group.

Keywords: Functional exercises, MetCon method, anaerobic capacity, reaction speed, agility, basketball

Introduction
Numerous fresh and contemporary training techniques that are tailored to the player's talents and nature have been made possible by advancements in science. As a result, the organisation, structure, and form of the training process have changed to reflect the new approaches, techniques, and resources that have been developed. In order to achieve and take advantage of the specialization of training in relation to the game type, trainers strive to choose the best and most modern methods suitable for the specialized activity and to understand the responses and adaptations that occur during sports practice activities. The ultimate goal is to directly raise the functional and physical level (Almali, 2021) [7].
Sports training science has recently witnessed significant development, with the focus now on applying more efficient and effective training methods to develop the specific physical capabilities of each sport. In this context, high-intensity interval training (METCON) has emerged as a modern training method that aims to improve the body's metabolic capacity by combining strength and speed exercises in intermittent, intense periods. This method repeatedly depletes anaerobic energy stores, stimulating the body to adapt and improve the efficiency of these systems, which directly aligns with the performance requirements of basketball. (Haff & Triplett, 2015) [19].

Among the sports that have received a large share of attention is basketball. It requires a high degree of energy to perform the motor task with strength, speed, and agility in motor performance, in order to perform the skill smoothly and perfectly. It often requires quick reactions, by taking the appropriate defensive position to gain possession of the ball, or by following the ball offensively and shooting towards the basket (Naser & Almali, 2023: Madloul *et al*., 2025) [28, 26]. To achieve this, attention must be paid to the functional aspect by adding functional exercises and focusing on them greatly during the training curriculum. Juan Carlos thinks that workouts Exercises that coordinate muscle activation to provide the most possible energy for motor tasks are known as functional exercises. They are the most effective and efficient method for building muscles and their potential at every level. They shield joints from harm and enhance strength, balance, agility, and flexibility (Carlos 2016: Hashem *et al*., 2022) [14, 20].

The metabolic conditioning (MetCon) method, one of the newest training approaches that makes use of high-intensity exercise, is among the most recent contemporary training techniques over a short period. Jason Rook views this method as "specific exercises and drills aimed primarily at improving specific energy systems, with the goal of achieving adaptation and efficiency in the phosphogyne energy system." (Rook 2014: Radhi & Obaid, 2020) [31, 29]

This is consistent with the nature and characteristics of the game, which requires high speed and agile reactions throughout the match, without slowing down in performing various skills. This creates a state of functional adaptation, thus improving performance under extreme work conditions and elevating the functional, physical, and skill levels of players.

Thus, the importance of the research is concluded by the effectiveness of this training method, which improves the player's functional, physical, and skill capabilities. This is manifested in the preparation of functional exercises using the metabolic conditioning (MetCon) method to help the player reach higher levels throughout the match through focus and fluidity. Perform skills.

Research Problem

The nature of skill performance in basketball is characterized by speed, continuity, and quick reaction. This requires the player to be quick to anticipate the correct position and then follow the ball and play. Therefore, the player requires a great deal of physical and functional integration. If the game continues for a long period, this leads to slow movement to take the correct position while performing these skills. This negatively influences the team, leading to the loss of many crucial points in the match. The researcher believes that there is a weakness in some biomotor abilities, which leads to poor physical fitness among players, especially during the final periods of the game and at the end of each period. Therefore, the researcher used the Metcon method, which is one of the techniques that maximize the body's full potential. According to the expert, it will help the player's physical and physiological development. Given the foregoing, the following query can be used to sum up the study problem:

Does the use of exercises using the metabolic adaptation method (MetCon) have a positive effect on anaerobic capacity, reaction speed, agility, and skill performance in basketball for young players?

Research Objectives

a) To develop functional exercises using the metabolic conditioning (MetCon) method for basketball.
b) To identify the effect of functional exercises using the metabolic conditioning (MetCon) method on anaerobic capacity, reaction speed, agility, and offensive and defensive follow-through of youth basketball players.

Research Hypothesis

There is a positive effect of functional exercises using the metabolic conditioning (MetCon) method on anaerobic capacity, reaction speed, agility, and offensive and defensive follow-through of youth basketball players.

Research fields

a) **Human field:** basketball players under the age of eighteen who play for Al-Hillah Sports Club.
b) **Time field:** January 7, 2024, to January 9, 2024
c) **Spatial field:** The Sports Talent Hall in Babylon is the spatial field.

Method

Research Methodology

The kind of approach the researcher uses to get the intended results depends on the study topic. Thus, in order to accommodate the nature of the study, the researcher employed the experimental technique with a comparable experimental and control group design, complete with pre- and post-tests.

Research Community and Sample

The Al-Hilla Sports Club's twenty-four young basketball players under the age of eighteen comprised the research community. A thorough census was used to choose the research sample, and a random lottery method was used to divide them up. The players' names were written on similar papers, which were then closed in the same manner and put in a box. The names were then drawn, and 12 players were placed in the experimental group and the remaining 12 in the control group.

Description of Measurements of the Variables under Study

RAST (Running-Based Anaerobic Sprint Test) (Draper & Whyte1997).

- **Purpose of the test:** To measure maximal anaerobic power.
- **Equipment required:** A 35-meter running track, a stopwatch or timing device, a scale to measure body weight, and a calculator to record results.
- **Test steps**

a) **Warm-up:** Jog lightly for 5-10 minutes. 2. Test procedure - The athlete is asked to run 6 sprints (over a distance of 35 meters) at their maximum possible speed. 3. Rest only 10 seconds between each sprint. The time of each sprint is accurately recorded (in seconds).
b) **Calculate the results:** Max anaerobic power = Distance * Weight / Best time (unit of measurement: Watts)

Nelson Reaction Speed Test (Adna A et. al. (2019) [3]

- The test's objective is to assess a person's capacity to react to a chosen stimulus with speed and accuracy.
- **Tools:** A measuring tape and a level, unobstructed space that is 20 m long and 2 m broad.
- **Method:** Three lines, each one meter long and spaced 6.40 meters apart, designate the test area.

Performance Requirements

- The referee is positioned at the other end of the line, facing forward, while the tester is positioned at each end of the centre line (Figure 1).
- With their torso bending forward and the centre line between their feet, the tester establishes a ready stance.
- The referee swiftly shifts their arm to either the left or the right.
- The tester responds to the start signal and tries to move as quickly as possible in the specified direction in order to reach the side line, which is 6.40 meters from the center line. When the tester crosses the correct side, the referee stops the exam.
- The referee will continue the test until the tester changes course and crosses the proper side line if the tester begins running in the wrong way. The examiner is allowed ten trials in a row, five on each side, with a 20-second pause in between.
- Each side's attempts are chosen at random. Ten identically sized and colored pieces of cardboard are produced in order to do this. Designate five of them as "Left" and the remaining five as "Right." After that, these parts are inverted and put in a box or bag before being taken out without being examined.

Test Instructions

a) Every examinee is given many chances to become acquainted with the test processes outside of the allotted time period and under the same fundamental circumstances.

b) The beginning signal must be practiced by the judge.The judge notes the previous 10 cards in the order they were drawn on a special card after drawing them at random before to administering the test. To assist the examinee in following the signal directions, the judge holds this card in one hand. Every examinee's time is noted independently. The purpose of this process is to keep the examinee from guessing the course of the subsequent attempt.

The fact that the tester must complete 10 trials evenly split between the two directions should not be known to them. It's possible, though, that there are more trials in one way than the other, and that the sequence of trials changes from tester to tester and is not statistically significant.

a) At the start of the exam, the judge shall indicate, "Ready-Start." The period between "Ready-Start" should be between 0.5 and 2 seconds for every trial.

b) Light warm-up activities should be performed by the tester. Light shoes are ideal, and there should be no obstacles in the test location.

c) **Recording:** Each trial's time is computed to the closest second.

d) The average of the 10 trials is the tester's score.

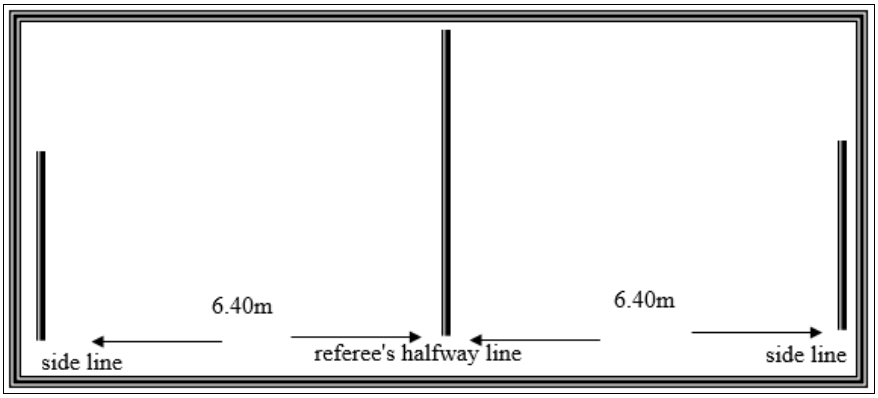

Fig 1: Shows a schematic diagram of the Nelson test area for the transitional motor response

To time the trials, the researcher videotaped the motor response speed and extracted the timings with extreme precision by calculating the time to within 10% of a second using an electronic computer and extracting the arithmetic mean for each player.

Test Name: Barrow 1 Zigzag Run (Alawi & Radwan, 1989) [4]

- **Purpose of the Test:** Measure Agility
- Utilising the following equipment, the tester starts high, behind the starting line. Three consecutive times, the tester zigzags between the five posts after getting the start signal.

Test Conditions

- The test subject begins running from a standing position at the starting line. The running direction is in accordance with the figure (8) shown in the drawing. The poles and markers should not be pulled, pushed, removed, or moved from their places or collided with rather, the test subject should circle around them. When the test subject completes three laps, the test subject continues running until they cross the finish line. The test should be explained and a model created before implementation.
- The test subject is given only one attempt.
- **Recording Method:** From the time, the start signal is given until the test subject crosses the finish line after completing the third circuit, the time it takes them to complete the three laps is recorded to the closest fraction of a second. This is seen in Figure (2).

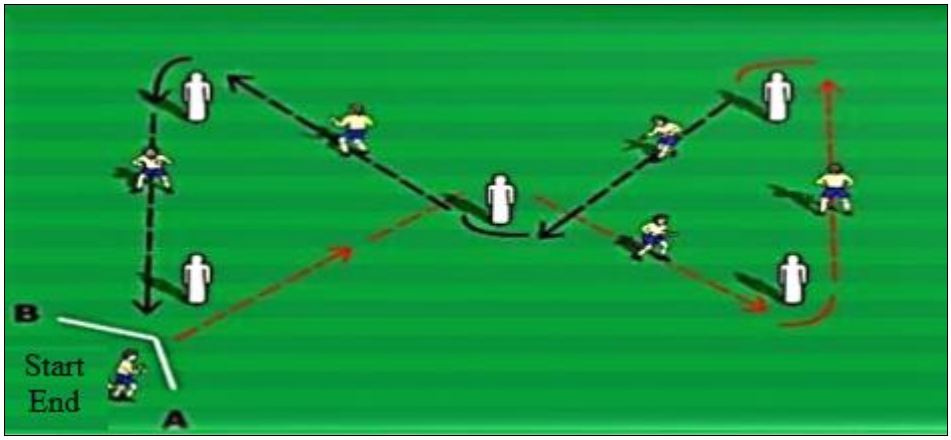

Fig 2: Agility test, zigzag running using the Barrow method.

Shooting test from under the basket for (45) seconds: (Bahi, and Omran, 2007) [12]

- **Purpose of the test:** The ability to shoot sequentially.
- **Equipment required:** A basketball, a basketball goal, and a stopwatch.
- **Test specifications:** The test subject stands in any location they choose under the basket with the ball. Upon hearing the start signal, they shoot, then pick up the ball and shoot again, and so on for the largest possible number of shots within (45) seconds.
- **Test instructions:** The test subject has two attempts, the best of which is credited.
- If the end signal is given after the ball has left the test subject's hand and hit the target, this attempt is credited.
- **Recording Method:** The number of successful attempts that hit the target within the specified performance time of (45) seconds is counted.

Defensive Slide & Jump Test (Krause *et al*., 2008) [25]

- Purpose of the test: To assess a player's ability to maneuver defensively with quick reactions when jumping to intercept the ball or cover a goal.
- Equipment and Tools Used

a) Basketball court.
b) 5 cones (or floor markers).
c) 50 cm high jump block (or training bench).
d) Stopwatch.
e) Basketball

- **Test Procedures**

a) **Preparing the Track:** Place 5 cones evenly spaced (2 meters apart) in a zigzag pattern.
b) Place a jump box at the end of the track.
c) Test Conditions
d) The player starts in the basic defensive stance.
e) The player moves sideways between the cones, changing direction quickly.
f) Upon reaching the last cone, they jump vertically over the block (or touch the goalpost if a jump box is not available).
g) Immediately return to the defensive position and accelerate back to the starting point in the same manner.
h) Repeat the test 3 times, taking the best time.

- **Recoding**

a) Level / Time (10m round trip + jump) Technique
b) Excellent 12 seconds | Quick defensive movement, high jump, excellent balance.
c) Good 13-15 seconds | Minor positional errors or delayed jump.
d) Average 16-18 seconds | Noticeable slowing or loss of balance during jump.
e) Poor 19 seconds and over | Crossed feet, incorrect position, weak jump.

Exploratory experiment

Once all the prerequisites for the primary experiment have been prepared, this is one of the foundations of the researcher's fieldwork. It is described as "a small, preliminary, and training pilot study to refine field procedures before engaging in data collection." Hashem (2012) [20]

A set of six gamers participated in the researcher's first exploratory experiment on June 23, 2024. In this experiment, the researcher's goals were to:

- Verify the validity of the tests to avoid errors that might arise during the implementation of the main experiment.
- Verify the validity of the tools used.
- Determine the time taken for each test and for the total test.
- Determine the difficulty and ease of implementing the tests.
- Determine the intensity to be used for the training program exercises, which ranged from 85-95%.
- Determine the time taken for each exercise and for the total exercise.
- Determine the difficulty and ease of implementing the exercises prepared by the researcher.

Scientific Foundations of Tests

The following scientific underpinnings for the tests utilised in the study were taken from the research

A. Validity:

According to Abdul-Dayem and Hassanein (1999) [2], validity is "the ability of a test to measure what it was designed for or the trait to be measured."

Content validity was used for the test, as the details of the tests were presented to a number of experts specializing in physiological, physical, and skill tests, all of whom confirmed the validity of the test in measuring what it was designed for.

B. Stability

The researcher used the test-retest method to determine the stability coefficient. Mustafa Bahi emphasized that "this method allows for repeating the research on the same sample two or more times under the same conditions as possible to achieve test stability" (Bahi, 1999) [11].

As stated above, the exam was given for the first time in the pilot experiment on June 23, 2024, and then again seven days later in the pre-tests on June 30, 2024, while accounting for all the circumstances surrounding the initial test administration. The stability coefficient was extracted by the researcher using the basic Pearson correlation coefficient, as indicated in Table (1). Because of this, the tests are quite stable.

C. Objectivity

Test objectivity means "a test in which there is no discrepancy between the opinions of the judges, even if more than one judge judges the test subject" (Al-Yasiri, & Majeed, 2002). The objectivity of the tests was established on June 23, 2024, by recording the results by two judges who judged the results for each test subject, and extracting the simple correlation coefficient (Pearson), as shown in Table (1).

Table 1: Scientific foundations, stability coefficient, and objectivity of the tests.

S. No.	Tests	Stability	Objectivity
1	Anaerobic Capacity Test	0.94	0.90
2	Reaction Speed Test	0.72	0.91
0.72	0.91	0.88	0.90
3	Agility Test	0.92	0.93
3	Offensive Follow-Up Skill Test	0.85	0.87

Pre-tests

Pre-tests for the research variables were conducted at the Sports Talent Hall in Babylon on June 30, 2024.

Sample Homogeneity and Equivalence

The researcher confirmed the homogeneity of the research sample members in terms of height, mass, chronological age, and training, as indicated in Table (2), in order to satisfy the requirements of the experimental design and control the variables that affect the research outcomes.

Table 2 Two research groups' homogeneity.

S. No.	Scales	Unit of measurement	Homogeneity		Type Sig
			F value	Level Sig	
1	Body mass	kg	0.561	0.466	Non sig
2	Height	cm	0.265	0.615	Non sig
3	Age	month	0.055	0.818	Non sig
4	Training age	month	0.966	0.342	Non sig
Significance level ≤0.05 under 10 degrees of freedom					

To begin the experimental design with a single starting point, the researcher must establish equivalence between the two groups on the primary and dependent variables using the t-test for independent samples equal in number between the experimental and control groups for all tests, as shown in Table (3).

The test results for the variables under investigation were the same for the two research groups, as indicated in table (3). The calculated t-test values were not statistically significant at a significance level of 0.05 and a degree of freedom of 10, although the significance level (Sig) was greater than 0.05. This implies that the two groups began each test at the same place.

Table 3: The two research groups' equivalency on the examined tests

S. No.	Scales	Unit of measurement	Equivalence		Type Sig
			T value	Level Sig	
1	Anaerobic Capacity Test	kg/s	1.23	0.24	Non sig
2	Reaction Speed Test	second	1.59	0.14	Non sig
3	Agility Test	second	1.426	0.21	Non sig
4	Offensive Follow-Up Skill Test	Count.	0.66	0.52	Non sig
5	Defensive Follow-Up Skill Test	degree	1.75	0.13	Non sig
Significance level ≤0.05 under 10 degrees of freedom					

Main Experiment

The researcher prepared the details and requirements of the main experiment as follows:

- The exercises prepared by the researcher (See Appendix No. (1) will begin on Monday (July 1, 2024).
- The high-intensity interval training method - repetitive training will be used.
- The target resting heart rate will be 120 bpm.
- The total training duration will be (8) weeks.
- The number of weekly training units will be (3 units).
- The total number of training units will be (24 training units).
- The weekly training days will be (Sunday, Tuesday, Thursday).
- The exercises are performed for 20-30 minutes during the main section.
- The nature of the work with the metabolic conditioning (MetCon) method is similar to the circuit training

method, as you move from one exercise to another after performing one repetition of each exercise, depending on the nature and form of the intended exercise. However, it differs from the circuit method and other training methods due to the presence of short rest periods between exercises, while noting the high training intensity. This is what distinguishes the metabolic conditioning (MetCon) method.

- The intensity is determined by the repetition and time of the exercises.
- As for the control group, the trainer used a medium and high intensity training method, where the intensity used with them was 75-90% of the maximum intensity, with relatively large rest periods of up to 90 seconds between exercises and up to 180 seconds between sets.

Post-tests

The researcher conducted the post-tests on September 1, 2024, at 4:00 PM, in the Talented Sports Hall in Babylon. The researcher ensured that conditions were similar to those of the pre-tests in terms of time, location, tools used, and test implementation methods.

Statistical Methods Used in the Research

The researcher utilized the statistical package (SPSS) to develop appropriate statistical treatments.

Results

Results are presented, analysed, and discussed.

Results of the experimental and control groups on the variables under study are presented, analysed, and discussed.

The findings of the experimental group's pre- and post-tests on the variables under study are presented and analysed.

Table 4: difference between the experimental group's pre- and post-test results on the variables under study, along with the arithmetic means, standard deviation, and value of (t).

Tests	Unit of measurement	Pre-test		Post-test		T value calculated	Level Sig	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
Anaerobic Capacity Test	Watt	795.416	3.964	815	13.314	4.524	0.001	Sig
Reaction Speed Test	Second	1.981	0.047	1.905	0.035	4.424	0.001	Sig
Agility Test	Second	20.933	0.451	19.075	0.142	12.877	0.00	Sig
Offensive Follow-Up Skill Test	Count	31.416	0.668	34.333	0.651	110.920	0.000	Sig
Defensive Follow-Up Skill Test	Time/second	15.958	0.611	13.816	0.220	11.267	0.000	Sig

If the error level is less than 0.05, it is considered significant at the significance level (0.05).

Table (4) shows that the error level for all study variables is (0.00), which is less than (0.05), given a degree of freedom of (5) and the significance of the differences between the pre- and post-tests at an error level of (0.05).

Presentation and analysis of the findings comparing the control group's pre- and post-test scores on the variables under study

Table 5: Arithmetic means, standard deviation, and value of (t) as well as the difference between the control group's pre- and post-test results on the variables under investigation.

Tests	Unit of measurement	Pre-test		Post-test		T value calculated	Level Sig	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
Anaerobic Capacity Test	Watt	791.250	5.276	797.083	5.418	4.841	0.001	Sig
Reaction Speed Test	Second	1.990	0.015	1.959	0.026	3.005	0.012	Sig
Agility Test	Second	20.816	0.309	19.991	0.707	3.843	0.003	Sig
Offensive Follow-Up Skill Test	Count	31.5	0.707	33	1	3806	0.003	Sig
Defensive Follow-Up Skill Test	Time/second	15.775	0.594	14.141	0.339	7.545	0.000	Sig

* If the error level is less than the significance threshold (0.05), it is considered significant.

The importance of the differences in this test favouring the post-test is shown by the fact that the error level is less than 0.05, as shown in Table (5).

Presenting the results of the differences between the post-test results for the variables under study in the experimental and control groups

Table 6: The value of (t), the error level, and the significance of the variations between the control and experimental groups' post-test results on the variables under investigation

Tests	Unit of measurement	Experimental group		Control group		T value calculated	Level Sig	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
Anaerobic Capacity Test	Watt	815	13.314	797.083	5.418	4.318	0.001	Sig
Reaction Speed Test	Second	1.905	0.035	1.959	0.026	4.230	0.000	Sig
Agility Test	Second	19.075	0.142	19.991	0.707	4.399	0.000	Sig
Offensive Follow-Up Skill Test	Count	34.333	0.651	33	1	3.870	0.001	Sig
Defensive Follow-Up Skill Test	Time/second	13.816	0.220	14.141	0.339	2.779	0.011	Sig

* If the error level is less than 0.05, it is considered significant at the significance level (0.05).

For all study variables, the error level varied between 0.00 to

0.014, which is less than 0.05, as Table (6) demonstrates. This suggests that the differences between the post-tests at an error level of 0.05 with a degree of freedom of (10) were significant and in favour of the experimental group.

Discussion

Test results showed considerable disparities between the control and experiment groups' pre- and post-test results, which may favor the post-test results in the test results of the study variables in tables (4, 5, and 6). The study indicates the training strategies and tactics used by the coach caused the differential change in players' performance. The experimental group's markers for functional adaptations were happening within certain limits due to the now constant repetitions and the continued nature of sports training practiced by members of the control group. These varied differences can be accounted for by the totality of these variables. Therevariances inthe post-test scores among the members of the experimental group can be not on the efficacy of the functional exercises created by the researcher, as to exploit the metabolic adaptation process, and standardizing to energy production, and according to the нагрузка for muscular work. Furthermore, it was evident the researcher's work improved the participants physiological function with training effects. The researcher assured this got with the metabolic adaptation exercises were positively performing to the study goals and the specificities of the game along with the set AND participants physical and physiological capacities. This came about due to the high intensity anaerobic training - in which the researcher controlled regular maximum and near maximum load intensity and created an oxygen deficit stage for fuel production. Additionally, the researcher accounts for the relevance of the variations between the measures taken before and after, as it relates to the members of the experimental group's enthusiasm and commitment to engaging in continual exercise on a regular basis. If it was to an extent enable the muscles to build up the ability to generate the required amount of energy to complete the physical effort but equally develop functionally the respiratory circulatory system, that also allowed for adaptation and improvement as it relates to short term anaerobic capacity scores in the post measurements. Abdel Fattah (1999) [1] also indicated, "Systematic" training results in functional changes in body systems - including, but not limited to the heart and circulatory system. Training was intense. If functional changes take place will carryover - time to produce physical effort, well-trained individuals will adapt and maintain effort.

The researcher believes that functional exercises using the metabolic conditioning method (MetCon), most of which were directed towards anaerobic work for a specific period of time, forced muscle cells to be in a state of adaptation through working with the metabolic adaptation method. The basic principle of this method is to work in a state of physiological imbalance necessary to complete muscular work. Jason Rook confirms this: "The metabolic adaptation method (MetCon) is based on specific exercises and training aimed at improving certain energy systems, mainly, and the objective is to offer efficiency and adaptability in the phosphagen energy system." (Rook 2014: Radi *et al*. 2020: Naser *et al*. 2025) [31, 30, 27]. This is confirmed by "It is not possible to neglect" This method of training athletes helps them achieve their desired goals and achieve outstanding performance (Al-Mandlawi, 1990) [8]. It is worth noting that anaerobic capacity is based on energy production in the absence of oxygen. It requires work of extreme intensity and a very short duration of performance, which enhances the activity of the important and essential phosphagen enzymes.

According to the researcher, the experimental group members' employment of functional workouts utilising the metabolic adaption technique (MetCon) is the cause of the notable variations in reaction speed that can be seen in the tables above. Here, it is important to note that the idea behind functional exercises is to use movements and work the body's muscles collectively, with high compatibility between them. This is the essence of increasing speed through neuromuscular compatibility, where there is no work for a single muscle but rather the entire body is created (Carlos, 2016) [14], also made note of this in Training that uses all of the primary and secondary muscles that contribute to the execution of motor performance and creates what is known as skill stability throughout performance is a force that strikes a balance between continuous neuromuscular work and the recruitment of motor units inside the muscle. (Dixon, 2011).

According to this, all the components of the training load must increase proportionately to the athlete's total progress; that is, the more the player improves, the more training load components must be increased (Naser & Almali, 2023) [28]. Because this would help the player practice skills More specifically, the researcher was excited for these exercises to be in a variety of movement directions.

Additionally, by coordinating the mechanism by which the functioning muscles tense and relax, functional exercises have been shown to increase the speed of motor transition, which is reflected in the speed of reaction and the motor speed of the legs. This facilitates the easy and systematic execution of the movement. This is in line with the statement that “Exercises that incorporate multidirectional movements are among the best ways to enhance physical capabilities.” (Schmitz, 2003). This is because to increase speed, diversity, and shift of play from one ability to another, whether defensive or attacking, the player must possess a high degree of speed and speed of reaction. As a result, the researcher concentrated on activities that tested response time.

“And through the training of a skillful and physical nature that every player executed with accuracy and great skill, as these workouts are designed to increase the athlete's physical and skill capacity by utilizing abilities and a movement pattern that is similar to the needed sport.” (Biain, 1989). Since this capacity is one of the essential components for successful motor performance, the exercises designed utilizing the metabolic adaption method (MetCon) significantly aided in its development. This is further supported by the fact that it is linked to the accuracy factor in order to integrate the response's precision and speed. The quickest and most effective way to complete a skill or tactical assignment is to accomplish it first cognitively and then mechanically. Because their goal is to combine motor and physical skills in the performance, the physical exercises that accompanied the skill exercises therefore shown substantial effects in the differences (Hussein, 1998).

The researcher also attributes the standardization of training loads using the metabolic adaptation (MetCon) method for exercises to an important factor that led to an increase in the level of biomotor capabilities. This is because the development of any ability, whether physical or motor, depends on the correct standardization of the components of the external load (intensity, volume, rest) with the internal load (the physiological adequacy of the body's internal systems). The researcher relied on the literature of the metabolic adaptation (MetCon) method to develop biomotor

capabilities, by standardizing the repetition of performance with the nature of the intensity used, "and through exercises of a skillful and physical nature that every player executed with accuracy and great skill since these workouts are designed to increase the athlete's physical and skill capacity by utilizing movement patterns and talents that are similar to the needed sport." (Almayly, & *et al*., 2023). Additionally, the researcher attributes the experimental group's dominance over the control group in (reaction speed and agility) to the nature of the skill exercises, which helped develop these capabilities. These exercises were explosive and variable from moment to moment, as the speed of response depends on the speed of response. On movements with instant reaction and that the exercises prepared using the metabolic adaptation method (MetCon) contributed greatly to the process of linking agility, one of the prerequisites for successfully executing this technique with remarkable speed and precision is response speed and competence. Additionally, the researcher's application of the diversification and change concept in conjunction with scientifically conducted continuous repetitions had a significant role in the development of this talent, which is dependent on abrupt and rapid movements. "Diversifying the experience of the exercise and organising it and diversifying the Players will have a better experience and be able to execute the skill more effectively with mobility," as stated by Magill (Radhi, & Obaid, 2020) [29], is a confirmation of this.

Biain states that various speed training exercises enhance the effectiveness of the neuromuscular system to conduct rapid and strong movements in opposite directions, while minimizing the time necessary to accomplish these opposing variables (Biain, 1989).

The use of jumping exercises also has a significant impact on developing agility, which is represented by a reduction in the time required to change direction on the ground and in the air (Al-Khatib, 1991). Furthermore, the development of physical and motor abilities helped develop agility among the sample members, stating, “Agility is intimately related to both strength and speed.” (Khaleq, 1999). "Agility develops as a result of the development of speed, flexibility, and the individual's general level of endurance. This is evident when changing from one skill to another or when changing an individual's speed or direction, as agility combines more than one ability; it is a comprehensive characteristic of other qualities."

This was confirmed by "When developing or enhancing agility, some new motor exercises must be added during the training process to ensure an increase in motor balance." (Hussein & Jamil, 1988) [23].

According to the study, the activities are what lead to the development of agility ability. By increasing the effectiveness of the nervous and muscular systems, enhancing the nerve signals that reach the muscles, and decreasing the appearance of excessive movements, the members of the experimental group improved body coordination and gave the impression of fluidity in movement when shifting positions and directions.

The researcher believes that the skill development achieved was a result of the physical development and also the exercises performed by the members of the experimental group, as these exercises helped with rapid movement in moving to take the appropriate position, in addition to the ability to repeatedly jump upwards, as Brian confirms that (the player who jumps for the follow-up is the winner, as his chances of obtaining the ball increase in a better way) (Coleman, & Ray, 1990) [15]. In addition, the significance of the differences between the two groups in the defensive or offensive follow-up performance test is due to the use of high-intensity training. The desired results came as a result of the correct combination of these exercises and the correct standardization of them and their non-conflict, in addition to the coordination of the exercises with the training methods, which are coordination exercises that work to involve more than one movement in a single exercise, which helps to increase the motor programs related to the capabilities of defensive and offensive follow-up. Indicates that “According to research, the neuromuscular system responds better when it is constantly stimulated in a different way. To force the neuromuscular system to adapt, it must be surprised, which can be achieved by doing various exercises for a few days at varying intensities and repetition counts.” “The exercises (Faraj, 2012) [18]. Depend on the defensive or offensive player taking the correct position in the places close to the basketball backboard. Here, the defensive player must be positioned between the offensive player and the basket in order to reduce his chances of catching the ball. When the ball bounces off the backboard or the basket, he must block the offensive player, stop him, and prevent him from occupying a place close to the ball. Then, the defender jumps high and catches the ball at the highest possible point. Therefore, the researcher was keen to develop the capabilities of defensive follow-up through these exercises, because the specificity of the training in them was to simulate the actual reality of the defensive or offensive follow-up skill by taking the appropriate position and harnessing the speed of reaction and agility according to the movement path of the skill, which all players performed with precision and high mastery. indicates that “by employing techniques and a movement pattern that are comparable to the athlete's area of specialisation and the necessary sport, the workouts seek to improve the athlete's physical capabilities.” (Al-Bishtawi & Al-Khawaja 2010) [5].

Conclusion

- The experimental group's pre- and post-test results on the variables under study showed statistically significant differences, suggesting that the particular physical workouts were successful in fostering anaerobic capacity among the players in the experimental group.
- The results of the pre- and post-tests for the experimental group on reaction speed showed statistically significant differences, suggesting that players in the control group improved their offensive and defensive follow-up skills as a result of improving their agility and reaction speed.

Recommendations

- For young basketball players (16–18 years old), it is essential to incorporate training activities into specialised training programs in order to maximise their physical and skill development. 2. Given their crucial position in basketball, coaches must invest enough time in training sessions to help players improve their agility and response time.
- Given their critical role in basketball training, young basketball players' offensive and defensive tracking abilities must be developed.
- Extend comparable research on additional populations, like the best basketball players in Iraq, whether at the club and national levels (young, and advanced).

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Appendixes

Appendix 1. Reaction Speed and Offensive Follow-Up Exercises

1. The player stands under the basket, and the coach stands above the free-throw line, facing him, holding tennis balls. The distance between the player and the coach is 3 meters. At the start of the exercise, the coach throws the balls toward the player, allowing him to catch them with one hand. The coach then returns them, and the coach randomly directs the balls to the player, to the right and left. The exercise continues, and so on.
2. Four colored balloons are hung on the board. The player stands close to the board, with his back to the board. The coach stands on the other side of the court above the free-

throw line. The player performs a half-dip hop. At the signal, the coach sounds the color of the balloon, prompting a player to turn and move quickly toward the balloon. At the same time, the coach throws the ball to the other side, allowing one player to perform an offensive follow-up and the other to perform a defensive follow-up. The coach then returns to his seat to repeat the exercise.

3. The player stands four meters away from the board with his back to the basket. Three red, yellow, and blue markers are placed behind the player.
4. The coach stands facing the player and performs the shooting skill. At the start, the coach flashes a colored marker. The player moves toward the cone. At the same time, the coach shoots toward the basket for the player to follow, then returns to the same spot. Stand at the side of the agility ladder and perform the scoop by jumping upwards with both legs alternately, the right leg and the left, so that the knee joint is at a 90° angle, the other leg is extended, and the push is with the bent leg at a 90° angle, with both legs right and left. The coach receives and hands the tennis ball after each scoop to the end of the ladder.
5. Two players stand behind the center line of the court, each on one side of the court. The players begin by running 6 meters, then jumping over hoops with both feet, then running toward the basket to follow the ball from one player, while the other player attempts to defend and retrieve it.
6. The player stands under the basket and places red and green cones. The coach stands on the opposite side, and the two players stand on each side of the court. At the start, the coach throws the ball upward to shoot toward the basket. At the same time, the player follows the ball. When he descends, he turns to the opposite side, where the coach releases the color cone, to receive the ball and then score from under the basket. The other player defends and attempts to retrieve the ball.
7. The player stands with his back to the backboard, holding the ball, and performs lateral movements to the right and left, then rotates his entire body to perform the follow-through by throwing the ball toward the backboard and advancing to receive it from a jumping position at the highest point.
8. Player (1) stands one meter from the basket, with his back facing the basket. Two other players stand on either side of the court, 6 meters away from the basket. One of the players, on assignment, shoots at the basket. Player (1) spins, follows the ball, and jumps up strongly to retrieve the ball. He then spins, dribbles, and shoots from under the basket.
9. Two cones mark a distance of 14 meters. The player then runs at full speed toward the other basket to follow the ball being shot by his teammate from the free throw area.
10. Cliff jumps from the side of the agility ladder with the right leg, then the left, bending the knee at a 90° angle and extending the other leg, alternately, over the agility ladder squares, while receiving and handling a basketball with the coach to the end of the agility ladder.
11. Mark lines at different distances, 5 meters, 10 meters, and 15 meters from the court. Run quickly, then stop suddenly on the line marked by the coach.
12. Free running, and upon hearing the signal, sitting on the ground, standing up again, and the coach throws the ball toward the basket for the player to follow.
13. Placing cones in different directions within the free throw area, the player circling around them, then suddenly standing on the cone designated by the coach.
14. Quickly starting from a seated position for a distance of (10) meters to the right and left sides after hearing the whistle, opposite the signal.
15. A player throws the ball toward the basket, hitting the hoop or one of the edges of the board. The player must follow the ball, shoot toward the basket, and score, while another player tries to obstruct the player and steal the ball.
16. Two cones are placed on either side of the court. When the coach blows the whistle and points to one of the cones, the player moves quickly in the opposite direction. At the same time, the coach throws the ball toward the basket. The player must quickly return to follow the ball and score, while another player attempts to obstruct the player during the offensive follow-through and steal the ball.
17. The player stands facing a defender, and the coach shoots toward the basket. The player must move quickly, get rid of the defender, and steal the ball and score. The defender attempts to steal the ball and prevent the player from shooting.
18. LED lights of different colors are placed in a circle with a diameter of 3 meters. When one of the lights is illuminated, the player must touch this light. After touching four lights, a player throws the ball toward the board, and the player must steal the ball and score.
19. The coach issues voice commands, such as (jump, right, Left, move forward, rush. The player must execute the commands very quickly. When the whistle is blown, one of the players throws the ball onto the board. The player must follow the ball and score, with a defender standing between them to prevent the player from continuing the attack.
20. Stand next to the agility ladder, hold the ball, and jump, rotating the entire body between the 12 squares of the agility ladder. Repeat the jump and rotation until the end of the agility ladder.

Appendix 2 Workout time in the training session: 22-25 minutes

Venue: Al-Mawhiba Sports Hall in Babylon

Objective: Develop anaerobic capacity, reaction speed, and offensive follow-up skills. Continuation: Two weeks.

Day and Date	Exercise Number	Exercise Intensity %	Performance	Number		Rest between		Time of one exercise	Time of the training unit
				Repetitions	Sets	Repetitions	Sets		
Monday July 1	1	85	20 sec	4	2	10 sec	60 sec	5.40 min	22.40min
	15	90	20 sec	4	2	10 sec	60 sec	5.40 min	
	7	85	20 sec	4	2	10 sec	60 sec	5.40 min	
	11	90	20 sec	4	2	10 sec	60 sec	5.40 min	
Wednesday	5	90	20 sec	4	2	10 sec	60 sec	5.40 min	25 min

July 3	9	85	25 sec	4	2	15sec	60 sec	6.50 min	
	14	90	20 sec	4	2	10 sec	60 sec	5.40 min	
	6	85	25 sec	4	2	15sec	60 sec	6.50 min	
Saturday July 6	12	85	25 sec	4	2	15sec	60 sec	6.50 min	25 min
	4	90	20 sec	4	2	10 sec	60 sec	5.40 min	
	8	85	25 sec	4	2	15sec	60 sec	6.50 min	
	3	90	20 sec	4	2	10 sec	60 sec	5.40 min	

Training session duration: 22-25 minutes
Venue: Talented Sports Hall in Babylon

Objective: Develop anaerobic capacity, reaction speed, and offensive follow-up skills

Day and Date	Exercise Number	Exercise Intensity %	performance	Number		Rest between		Time of one exercise	Time of the training unit
				Repetitions	Sets	Repetitions	Sets		
Monday July 15	20	90	20 sec	4	2	10 sec	60 sec	5.40 min	22.40 min
	4	95	20 sec	4	2	10 sec	60 sec	5.40 min	
	5	90	20 sec	4	2	10 sec	60 sec	5.40 min	
	12	95	20 sec	4	2	10 sec	60 sec	5.40 min	
Wednesday July 17	2	95	20 sec	4	2	10 sec	60 sec	5.40 min	25 min
	17	90	25 sec	4	2	15sec	60 sec	6.50 min	
	7	95	20 sec	4	2	10 sec	60 sec	5.40 min	
	13	90	25 sec	4	2	15sec	60 sec	6.50 min	
Saturday July 20	18	90	25 sec	4	2	15sec	60 sec	6.50 min	25 min
	9	95	20 sec	4	2	10 sec	60 sec	5.40 min	
	10	90	25 sec	4	2	15sec	60 sec	6.50 min	
	19	95	20 sec	4	2	10 sec	60 sec	5.40 min	

The training intensity is increased and continues for three weeks. In the final weeks, the training volume is increased by increasing the number of repetitions.