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The Effect of Proposed Training Program in Developing Maximum Speed and Speed Endurance of Basketball Players

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Abstract

Basketball is sport which implies the combination of high-intensity actions with periods of lower intensity and/or recovery. success in elite basketball is mostly determined by fast and power-based sport-specific actions which rely on anaerobic pathways. The aim of the current study is to develop the running ability (maximum speed and speed endurance) of basketball players. The researchers applied experiment method of independent sample with pre and post-tests. (12) participants as the research sample randomly selected from population. They went through a six-week training program consists of speed and speed endurance exercises (individual and group drills). Pre and post tests were applied to determine the effect of the training program on players. The statistical package of social sciences (SPSS) used to analyze the data. The results show that the training program was sufficient to obtain positive effect on speed endurance for basketball players but it was not statistically significant, therefore, the researchers recommended conducting further studies to develop maximum speed of basketball players by utilizing different training methods.

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1) Introduction

1-1 introduction and the importance of the research

A training program for basketball players should be composed of three critical phases: preparation, competition and transition. In each critical phase, emphasis is placed on four fundamental preparations: physical, technical, tactical and psychological. Among these preparations, the physical preparation is considered to be the major component in most training theories. One of the primary objectives of the physical preparation is to develop the unique fitness components required to attain achievement in a specific sport such as speed, endurance and strength (Ziv & Lidor, 2009)(Alalmy, 2021; Mousa, 2021; Qasim, 2022)

Basketball is an intermittent team sport which implies the combination of high-intensity actions with periods of lower intensity and/or recovery. Despite the high cardiovascular demands and the importance of aerobic metabolism in this sport, success in elite basketball is mostly determined by fast and power-based sport-specific actions which rely on anaerobic pathways. In fact, basketball-specific actions that involve sprinting or jumping have a key importance for scoring in this sport (Puente et al., 2017)(Ahmed, 2021; Shukri, 2021; Vian & Shelan, 2021)(Al-Saeed, 2018; Al-Saeed & Pain, 2017), in addition, basketball is a very demanding sport. A player performs approximately one thousand actions on average during a game, and at least one out of every ten requires high intensity. These include explosive movements such as sprints, jumps, accelerations and decelerations. Time motion analysis shows that players may cover several kilometers during a basketball game, comprising many high-speed movements in forward and lateral directions combined with decelerations from frequent sprint efforts (Montgomery et al., 2010)(Bilal Haider, 2021; Wahab, 2021).

Many offensive and defensive basketball movements are combinations of forward, backward and/or lateral movements. These rapid movements presumably combine to elicit a substantial physical demand (Al-Saeed et al., 2016). The aim of the current study is to develop the running ability (maximum speed and speed endurance) of basketball players as they are proved to be the dominant aspects of the game.

1-2 research problem:

It is well known that basketball require high level of physical performance especially rapid movements in addition to ability of maintain speed for longest time, high level of physical performance contributes in result determination and gives players self-confidence during the game by maintaining optimum level of technical performance. Throughout researchers'

observation of Qala basketball team in the last tournament there was a clear lack of speed and speed endurance in players performance leads the coach to substitute players more often in order to keep physical aspects of players in range in one hand, but on the hand this strategy of play affects playing efficiency of the team which leads to less play balance. Therefore, to overcome this deficiency the researchers prepared a training program to develop speed and speed endurance of players.

1-3 The study aims at:

1. Preparing a specific training program for developing maximum speed and speed endurance for basketball players.
2. Identify the effect of the proposed training program in developing maximum speed for basketball players.
3. Identify the effect of the proposed training program in developing speed endurance for basketball players.

1-4 The study hypothesis the following:

1. There are statistically significant differences between pre and posttests in maximum speed for basketball players.
2. There are statistically significant differences between pre and posttests in speed endurance for basketball players.
3. There are statistically significant differences between posttests in maximum speed and speed endurance for basketball players.

1-5 Research fields:

1-5-1 Human field: Male players of Qala basketball sport club.

1-5-2 Time field: from 6/5/2022 until 24/6/2022

1-5-3 Place: indoor hall at college of physical education and sport sciences.

2) Research method and field procedures:

2-1 Research method:

The researchers applied experiment method of independent sample with pre and post-tests which appropriates with the nature of the research.

2-2 Research population and sample:

The study population consists of four basketball clubs (Aso, Akad, Hersh and Qala) in Erbil governate with a total number of (52) players. And the research sample consists of Qala basketball players numbered (15) male participants and sample randomly selected from

population. (3) individuals removed from sample whom applied research exploratory experiment, the training program applied on (12) players with the percentage of (% 21.81) of research population.

2-3 Sample homogeneity:

The researchers applied the homogeneity of (age, mass, height and years of playing) variables in order to avoid the effect of the above variables on study results. the results illustrated in table (1).

Table (1)

show homogeneity of the research sample

n	variables	sample		
		mean	s.d	skewness
1	Age (years)	27.4	3.16	0.35
2	Mass (kg)	80.61	7.29	0.68
3	Height (cm)	185.37	6.13	0.44

2-4 Data collection tools:

1. Questionnaire form of appropriate physical tests (appendix 1).
2. Personal appointments.
3. References.
4. Measurements (height, weight and age).

2-5 Instruments and tools:

The following tools and instruments used:

1. Weight scale.
2. Laptop (Dell).
3. Basketball court (indoor hall).
4. Stop watch (2).
5. Whistle.
6. Tape marks
7. cones

2-4 Study tests:

A questionnaire form (appendix 1) of maximum speed and speed endurance tests prepared and distributes on experts in the field of exercise science and basketball in order to select appropriate tests. The tests with (%75) of experts' agreement are selected and applied in the study.

Table (2)

show the agreement percentage of physical tests

Test name	Types of the test	Agreement percentage
1- Speed tests	A- 20 m sprint test	% 10
	B- 30 m sprint test	% 90
2- Endurance tests	A- Yo-yo recovery test	% 80
	B- 300yard shuttle run test	% 20

2-4-1 30m sprint test:

Purpose: The aim of this test is to determine acceleration and speed.

Equipment required: measuring tape or marked track, stopwatch or timing gates, cone markers, flat and clear surface of at least 50 meters.

Procedure: The test involves running a single maximum sprint over 30 meters, with the time recorded. A thorough warm up should be given, including some practice starts and accelerations. Start from a stationary position, with one foot in front of the other. The front foot must be on or behind the starting line. This starting position should be held for 2 seconds prior to starting, and no rocking movements are allowed. The tester should provide hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and encourage them to continue running hard through the finish line.

Results: Two trials are allowed, and the best time is recorded to the nearest 2 decimal places. The timing starts from the first movement (if using a stopwatch) or when the timing system is

triggered, and finishes when the chest crosses the finish line and/or the finishing timing gate is triggered (Davis et al, 2000, 125).

2-4-2 yo-yo intermittent recovery test:

Purpose: The test evaluates an individual's ability to repeatedly perform intervals over a prolonged period, particularly for athletes from sports such as tennis, team handball, basketball and soccer or similar sports.

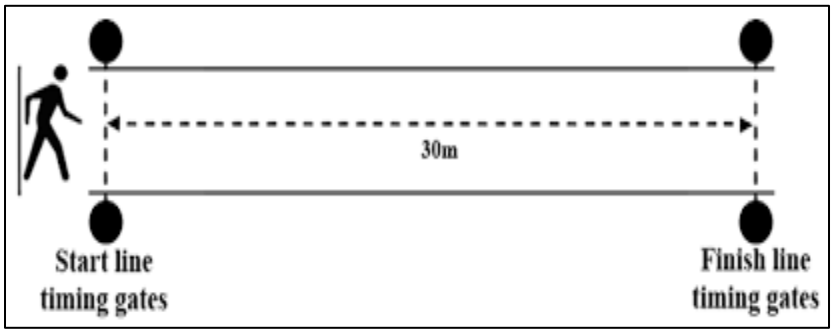
Equipment required: Flat, non-slip surface, marking cones, measuring tape, pre-recorded audio cd or mp3 (buy or use the Team Beep Test software), cd player, recording sheets.

Test layout: Use cones to mark out three lines as per the diagram above, 20 meters and 2.5 (endurance test) or 5 meters (recovery test) apart.

Procedure: The subject starts on or behind the middle line, and begins running 20 m when instructed by the cd. The subject turns and returns to the starting point when signaled by the recorded beep. There is an active recovery period (5 and 10 seconds respectively for the endurance and recovery versions of the test) interjected between every 20meter (out and back) shuttle, during which the subject must walk or jog around the other cone and return to the starting point. A warning is given when the subject does not complete a successful out and back shuttle in the allocated time, the subject is removed the next time they do not complete a successful shuttle.

Variations: for each of the recovery and endurance intermittent tests there are two levels: level 1 designed for lesser trained individuals and level 2 aimed at well trained and elite athletes and starting at a faster speed. Both test variations have increasing speeds throughout the test. In the current study level 1 test is used.

Scoring: The athlete's score is the total distance covered before they were unable to keep up with the recording. The Yo-Yo intermittent test usually takes between 6-20 minutes for level 1 and between 2-10 minutes for level 2. (Bangsbo et al., 2008)



2-5 Exploratory experiment:

The exploratory experiment conducted on (3) players from research sample at indoor hall at college of physical education and sport sciences – Salahhadin University / Erbil, on (Saturday 7/ 5 / 2022) in order to verify the following:

1. Validity of the equipment and tools used.
2. Tests appropriateness with participants' level.
3. Time period for each test and for the total procedure.
4. Identify any further difficulties faces researchers during procedure and attempting to avoid them.

2-6 Pre-test procedure:

Pre tests conducted on the research sample on (Sunday 8 / 5 / 2022) at indoor hall at college of physical education and sport sciences – Salahhadin University / Erbil to determine the level of speed and speed endurance of the study participants.

2-7 Application of the training program:

The aim of this study was to examine the effect of six-week training program consists of speed and speed endurance exercises (individual and group drills) on basketball players. The program took place over a period of six weeks started from (Tuesday 10 / 5 / 2022) until (Tuesday 21 / 6 / 2022) within (3) training units per week. All players participated in (18) units, each lasted for (60 minutes), appendix (2) show examples of training units. The players were in good physical condition and properly familiarized with all procedures before applying the program. Moreover, all experimental procedures were performed in coordination with the technical team.

2-8 Post-test procedures:

Post-tests conducted on the research sample on (Thursday 23 / 6 / 2022) at indoor hall at college of physical education and sport sciences – Salahhadin University / Erbil under the same conditions of pre-tests in order to identify the program level of effect on speed and speed endurance for study participants.

2-9 Statistical tools:

The statistical package of social sciences (SPSS) will be used to analyze the data by using the following

3) Illustrating, analyzing and discussion of the results:

3-1 Illustrating and analyzing of pre and post test results:

Table (3)

shows pre and post results of speed and speed endurance tests

Table (3) shows the mean and standard deviation of the sample in pre and posttests for speed,

n	variables	Measurement unit	Pre test		Post test		T value	P value	Sig
			mean	s.d	mean	s.d			
1	Speed	second	4.87	0.69	4.76	0.38	2.41	0.11	insignificant
2	Speed endurance	ml/min/kg	37.21	0.89	40.74	1.16	3.13	0.04	significant

pre-test mean and standard deviation was (4.87 and 0.69) respectively, and post-test values was (4.76 and 0.38) respectively. The (p value) was (0.11) which is greater than (0.05) mean there are no significant differences between pre and post in speed test for sample.

Likewise, same table shows the mean and standard deviation of the sample in pre and post tests for speed endurance, pre-test mean and standard deviation was (37.21 and 0.89) respectively, and post-test values was (40.74 and 1.16) respectively. The (p value) was (0.04) which is smaller than (0.05) mean there are significant differences between pre and post in speed test for sample.

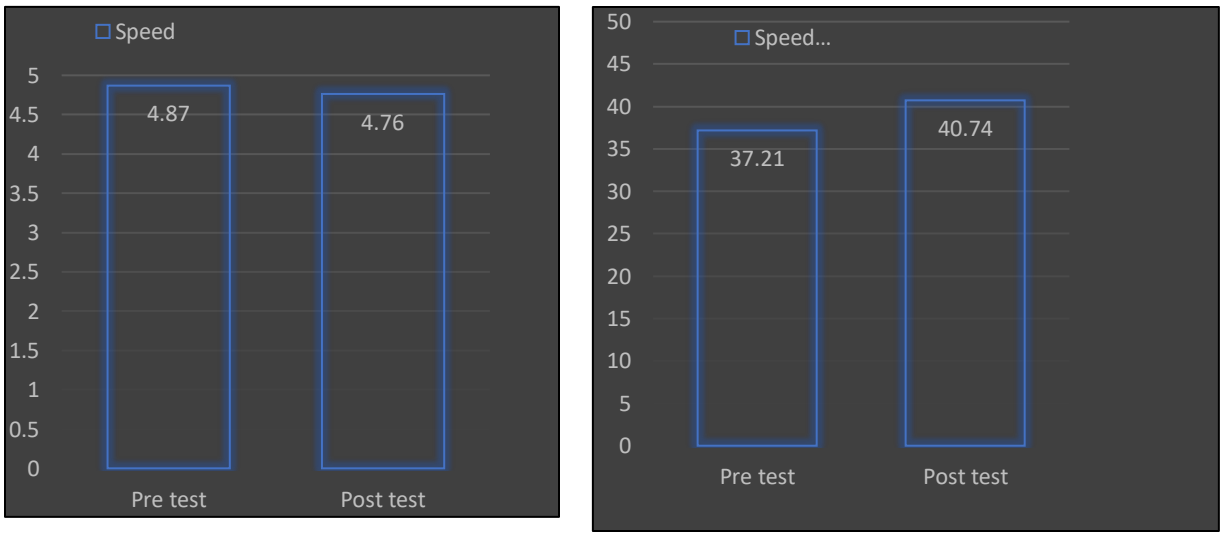


Figure (1)

shows the results of speed and speed endurance tests

3-2 Discussion:

Nowadays, training system consists of progressive exercises and instruction aimed at developing fundamental motor skills and improving the ability of the athlete to be more skilled at faster speeds and with greater precision. Speed and quickness become a popular way to train

athletes. The exercise also develops the ability to exert maximum force during movement activity at high speed (Azmi & Kusnanik, 2018). In addition, Motor abilities play an important role in the selection of basketball players and the progress in their playing performance (Erčulj et al., 2010)(ALtaai, 2019).

Exercise of speed quickness is exercises that enable players to improve the physical conditions. it suggests that the practice of speed and quickness can improve the physical condition of the components of speed, acceleration in addition to agility. quickness trainings become a popular way to train athletes to cover a complete spectrum intensity of exercise, from low intensity to high intensity, it can also be used to teach movements such as heating or to improve the physical condition of athletes (Sharma & Dhapola, 2015)

Speed is one of the basic capabilities' necessary bio-motoric in every sport(Alsaeed et al., 2023). The speed is very dependent on (Anwar abd alkader Mashi, 2018)power because without power, speed cannot be developed (Azmi & Kusnanik, 2018) The results of the current study show a slight reduction in running time which means there are slight improvement in sprint time but it is not statistically significant, this mean the training program had a positive effect on players speed, the reason of the results might be speed development need long rage training program, it is unlikely to develop speed in six week time significantly. Moreover, speed is highly depended on power, in order to improve speed, power also must be improved, which in this study the training program did not include any power or conditioning exercises. (Al-Din Ahmed et al., n.d.)

Although basketball is not an endurance sport but having high values of cardiopulmonary functions is important for the player to maintain a high level of activity during the entire game, in both defense and offence. The ability of basketball players to maintain high aerobic capacity during the entire season is of critical importance to both their basketball coach and their strength and conditioning coach (Ziv & Lidor, 2009)

Several studies demonstrated that basketball games at different competitive levels involve an important phase of the game covered in low-intensity activities. This determines the importance of speed endurance during the game of basketball which requires the players to maintain their optimum performance along the game and to do so, they must have a high level of speed endurance (Puente et al., 2017)

The applying program included several speed-endurance exercises in which enabled participants to develop their level of speed endurance. These exercises had a positive effect and

significantly developed this aspect in the players. The reason behind this improvement can be explained that endurance comparing to speed is likely to developed more efficiently and this improvement can also be seen after a short time after training and this is because of the nature of the components. In addition, one more reason might be the commitment of the individuals in applying these exercises and their desire to complete them properly as exercises were set in the method of competition between them individually and in groups.

4) Conclusions and recommendations:

4-1 conclusions:

The researchers concluded the following points:

1. The training program was sufficient to obtain positive effect on speed endurance for basketball players.
2. The training program did not have significant effect on maximum speed for basketball players.

4-2 Recommendations:

The researchers exposed the following points:

1. Utilizing current program for developing speed endurance of basketball players.
2. Conducting further studies to develop maximum speed of basketball players.
3. Conducting similar studies on different gender and aged groups.

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Appendix (1)

Experts and specialists' opinion form

The researchers intend to conduct research titled (The Effect of Proposed Training Program in Developing Maximum Speed and Speed Endurance of Basketball Players). In the point of scientific view of the experience and solid scientific knowledge of your scientific specialization, we kindly ask you to express your opinion on determining the most important test to measure speed and speed endurance of basketball players.

You answer is kindly appreciated.

Name:

Scientific title:

Specialty:

College/institution:

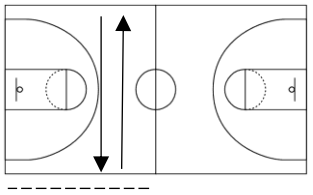
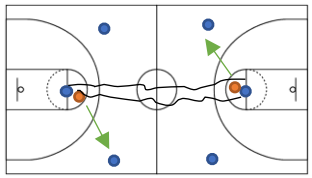
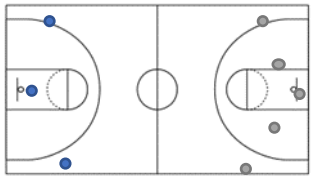
Date:

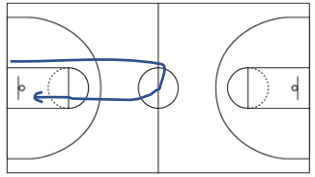
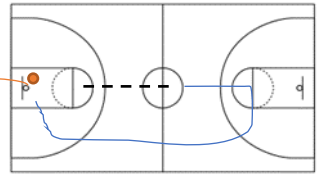
Signature:

Test name	Types of the test	Test selection	Notes
3- Speed tests	A- 20 m sprint test		
	B- 30 m sprint test		
4- Endurance tests	A- Yo-yo recovery test		
	B- b- 300yard shuttle run test		

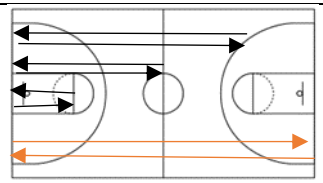
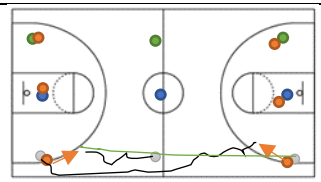
Appendix (2)
Maximum speed and speed endurance training units:

1. Maximum speed training unit:

N	Training	Training time (min)	Rest (min)	Reps.	Training total time (min)	description	diagram
1	Warm-up				15		
2	Sideline run	1	3	3	12	Line up all players on a sideline, after the signal they start running to opposite side and back for a total of (1 minutes) at high intensity.	
3	Hexagon pass	2	1	2	6	Put (6) cones in a shape of a hexagon, divide players on the cones with equal numbers with (2) balls in middle group hands, for the first set pass the ball to right direction and change place with opposite players, for second set passes goes to left direction.	
4	Wave (3 and 5)	4	4	1	9	Wave (3): every (3) players must perform full court wave drill on both baskets. Wave (5): same drill but in (5) groups.	

N	Training	Training time (min)	Rest (min)	Reps.	Training total time (min)	description	diagram
5	Half court lay-ups	5	Within drill	1	6	Lineup players under one basket, ball in hands, start running and high dribble as fast as possible to half court and run back to perform lay-up, second player starts and so on.	
6	Full court shot and rebound	2 min for each group	2	1	5		
7	One line rebound and sprint	1	3	3	7	Rebound the ball on air with one hand and run back to the line as fast as possible.	

2. Speed endurance training unit:

N	Training	Training time (min)	Rest (min)	Reps.	Training total time (min)	description	diagram
1	Warm-up				15		
2	Grassers	1	3	3	12	Line up all players on one baseline, after the signal they start running toward free throw line and back, then half court line and back to baseline, then other free throw line and back, then other baseline and back to the start point. Performed with moderate intensity.	
3	48 second drill	48 second	2	4	11	Entire team shall line up on one baseline and hold hands, the team shall run together to other baseline and back to start line twice in 48 seconds	
4	Full court continuous shooting	2	2	3	12	Divide players into (3) groups (3 players each, on (right- middle and left) of the ring. 2 balls with each group. After signal they start receiving the ball and shot until the end of time.	
5	Lakers lay-up	10	Within drill	1	11	Lineup players under one basket, first player will start slide run to left court corner then run toward half court line then run back toward the ring to receive the ball from the coach and shot, then slide run to right court corner, then half court line, run back for the ball and shot.