THE EFFECT OF PROPOSED EXERCISES ON DEVELOPING THE SPEED OF MOVING TOWARDS THE NET FOR YOUTH TENNIS PLAYERS

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ABSTRACT: *the aims of the study were the preparation of proposed exercises to develop the speed of moving towards the net for young tennis players, and to identify the effect of the proposed exercises on developing the speed of moving towards the net for youth tennis players. Design: an experimental design was used. Setting: the subjects were randomly divided into two groups; the control group and the experimental group which the later received proposed exercises from one-hour and fifteen minutes to one hour and twenty minutes. Participants: Twenty four participants were chosen from x Tennis Federation's Players and their mean age 19.86 ± 1.81 years. Main Measures: Pre- and post-tests included: 20 Metre Sprint test and Planned Agility test. Results: there was a significant improvement in speed of moving among the youth tennis players who had subjected proposed exercises. Conclusions: showed that the proposed exercises helped in improving the speed and physical abilities.*

Keywords: exercises; training; plyometrics; acceleration; youth.

1. INTRODUCTION

As all good players know, it doesn't matter how good the player can hit the ball if he cannot get to it. For success on the tennis court, correct movement skills are vitally important. Tennis requires movement in all directions. The player may have to move from side to side to reach wide forehands and backhands, sprint forward to reach a drop shot, or back up for an overhead [1]. The player doesn't overlook the importance of working on his movement on the court although it is essential to work on grooving the player's strokes. Just like his tennis strokes, the player footwork and movement can be improved if he works at it [2]. Efficient movement doesn't only depend on speed, but also agility. Velocity or speed describes the rate at which an athlete moves from one location to another [4]. Agility can be defined as "the capacity to control or maintain body position while quickly changing direction during a series of movements" [5]. Also, it is the ability to change direction efficiently match [2]. According to [6], agility is the capability to start or accelerate, stop (or decelerate and stabilize) plus changing direction quickly while maintaining proper posture.

Othera [7] and [8], mentioned that tennis requires a dynamic and complex interaction of physical attributes, whereby athletes are required to repeat explosive movements to the ball, produce strategically determined force throughout a stroke, and recovery to a new court position after contact. For [9]. one of the most important things in becoming a good tennis player is to be in the suitable position to hit the ball. [10] clarified that tennis players must move quickly to hold a favorable position on the playing court and to gain space and time. They are able to gain or obtain a tactical advantage and then win the tennis match.

In tennis, the preparatory movement before such a change of direction is called the split-step [2]. From [3] points of view, the split-step is a preparatory movement most often performed by a tennis player just before the opponent's shot or stroke. [3] added that the split-step represents an integral part of preparing for a volley, return of groundstroke or serve. The split-step purpose is merely to ready the body to move in any direction by putting the leg muscles 'on stretch' (ibid). The spilt –step enables a faster reaction, a fast start of the movement plus an effective change in direction as said by [4, 5, 6, 7]. For [10], the first step is important for:

1. Continuing the movement by initiating a forward movement,
2. Improving sprint performance over short distances.
3. Increasing force and power at push-off.

Others [3], illustrated that the quick first step gives the tennis player a distinct advantage. Being able to instantly recognize and react to the shot the opposing tennis player is using can be the difference between getting to a ball or not, attacking a ball, and hitting a winner as opposed to pushing back a defensive shot. The first step toward the ball is the most important. When absolute speed or velocity is needed for instance, when your tennis opponent hits a drop shot, an explosive first step becomes vital to quick movement.

In addition to movement speed, agility, and explosive movement, there are essential features like acceleration speed and deceleration speed. Acceleration is defined as "the capacity to increase speed or velocity rapidly". In other words, how well a player can go from a dead stop to his full speed. As shown in a research, the greatest acceleration occurs in the 8 to 10 strides a tennis player takes and that mechanics and technique play a critical role in determining how fast a tennis player can accelerate. On the other hand, deceleration is the capability to slow rapidly. Exercises that develop strength and explosive power as plyometric are essential for laying the groundwork for acceleration and deceleration by focusing on training the body for deceleration first, then acceleration [3].

Tennis is much more than just running in a straight line. Changing direction frequently is a huge part of the game. Players need to learn to go from shuffle steps to sprints to backpedaling in a matter of few seconds [3]. Therefore, agility and proper footwork aren't only crucial to good court movement but also positioning on the court. To improve agility, exercises like agility and plyometrics can be used. Usually, Plyometric exercises include stopping, starting, and explosively changing directions. These movements are components that can help in developing agility as stated by

[11, 12, 13]..

[3] claimed that speed development depends on power and muscular strength, and Training that develops these attributes will help improving on-court movement and performance. Thus, tennis players can use exercises such as plyometrics to improve speed. According to [14], Plyometrics are training techniques used by players in all types of sports to increase explosiveness plus strength. [15] added that Plyometrics include a quick stretching of muscle (eccentric action) which immediately followed by a shortening action or concentric of the same connective tissue and muscle. Researchers like [16,18, 19, 20].have shown that plyometric training can contribute the improvements in acceleration, muscular power, leg strength, vertical jump performance, and increased joint awareness when it is used with a strength-training program.

In the current study, the proposed exercises will be used to improve agility, speed, and explosive movement in order to develop the speed of moving towards the net for youth tennis players.

Therefore, the aims of the study were:

- The preparation of the proposed exercises on developing the speed of moving towards the net for youth tennis players.
- Identify the effect of the proposed exercises on developing the speed of moving towards the net for youth tennis players.

The Hypotheses of the study were:

- There are statistically significant differences between the pre-tests and post-tests of the study variables.
- There are statistically significant differences between the two groups in the post-tests of the study variables.

Subject

Twenty four participants were chosen from Iraqi Tennis Federation Players. Tennis players mean age was 19.86 ± 1.81 years, mean height 1.70 ± 07 m, and mean mass 60.36 ± 13.74 kg. Randomly, the Subject was classified into two groups; the control group and experimental group.

Procedures

During the study, the subject agreed not to change their current exercise habits. As shown in table 1 and 2, the proposed exercises group participated in 6-weeks training program, performing a variety of proposed exercises (agility, speed, and plyometrics), whilst the control group did not participate in any proposed exercises

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Table 1: Plyometric Exercises*:*

Training Week	*Training Volume (foot contacts)*	*Plyometric Drill*	*Sets X Reps*	*Training Intensity*
Week 1	90	Side to side ankle hops	2 X 15	Low
		Standing jump and reach	2 X 15	Low
		Front cone hops	5 X 6	Low
Week 2	120	Side to side ankle hops	2 X 15	Low
		Standing long jump	5 X 6	Low
		Lateral jump over barrier	2 X 15	Medium
		Double leg hops	5 X 6	Medium
Week 3	120	Side to side ankle hops	2 X 12	Low
		Standing long jump	4 X 6	Low
		Lateral jump over barrier	2 X 12	Medium
		Double leg hops	3 X 8	Medium
		Lateral cone hops	2 X 12	Medium
Week 4	140	Diagonal cone hops	4 X 8	Low
		Standing long jump with lateral sprint	4 X 8	Medium
		Lateral cone hops	2 X 12	Medium
		Single leg bounding	4 X 7	High
		Lateral jump single leg	4 X 6	High
Week 5	140	Diagonal cone hops	2 X 7	Low
		Standing long jump with lateral sprint	4 X 7	Medium
		Lateral cone hops	4 X 7	Medium
		Cone hops with 180 degree turn	4 X 7	Medium
		Single leg bounding	4 X 7	High
		Lateral jump single leg	2 X 7	High
Week 6	120	Diagonal cone hops	2 X 12	Low
		Hexagon drill	2 X 12	Low
		Cone hops with change of direction sprint	4 X 6	Medium
		Double leg hops	3 X 8	Medium
		Lateral jump single leg	4 X 6	High

Table 2: Agility and Speed Movement Exercises):

Session No.	Exercise	Duration/Repetitions
1-4	Spider drill	2 sets of 20-25 reps.
5-6	Ball pickup Spider drill	2-3 reps.
7-8	Spilt step	2-4 reps.
9-10	Spilt step with stimulus	2-3 reps.
5-6	Groundstroke recovery	2-3 reps.
9-10	Diagonal recovery	2-3 reps.
1-4	Lateral cone slalom	2-4 reps.
7-8	Forward and backward cone slalom	20 sec, 2 reps.
9-10	Sider run	2-3 reps.
5-6	Vertical repeater	2-3 reps.
11-12	Four-cone square	2-3 reps.
11-12	Forehand and backhand	20-30 sec, 2-3 reps.
11-12	Court widths or 17s	2 set, 2 reps.
1-4	Diagonal repeater	2-3 reps.
1-4	High-knee march, with arms	2-3 reps.
7-8	Skip with leg extension	2 reps.

Note: *These exercises have been described in detail elsewhere [13, 14].

The proposed exercises (speed, agility and plyometrics) group participated in the 6-weeks exercises program and they performed a variety of speed, agility and plyometrics exercises. The proposed exercises were developed using two training sessions per week from one-hour and fifteen minutes to one hour and twenty minutes allowing for sufficient recovery between workouts [21]. The training loads progressively increased in terms of volumes (90-140 foot contacts). The plyometric exercises were based on recommendations of volume and intensity as mentioned in [22] and [23]studies. The plyometric exercises were performed form forty-five minutes to one-hour by using similar exercises, sets, and repetitions (See Table 1).

The speed and agility exercises were performed form 15 - 20 minutes. The exercises were recommended by [24]. The exercises intensity was tapered so that fatigue would not be a factor during post-testing.

Testing Procedures

To determine the study outcomes, agility and speed tests were conducted for both pre and post testing. The T-test (20 Metre Sprint test) was used to measure acceleration to the ball plus speed in moving forward on the tennis court. The T-test (planned agility test) was used to measure the capacity of a player to be able to move effectively and quickly into a position of predetermined play. These tests were chosen not only based upon established criteria data for males, but also because of their reproducibility and reported validity of the tests (International Tennis Federation [ITF], 2019).

- 20 Metre Sprint test:

The aim of the test

- To measure acceleration to the ball plus speed in moving forward on the tennis court.

The equipment of the test

- Tennis court and stopwatch.

The Directions of the test

1. In the tennis ready position, the player begins at baseline.
2. The player sprints 20 meters without a racket as fast as possible on the coach's command.
3. Then, the player repeats three times.

The scoring of the test

- The best result only is recorded.

Planned Agility Test

The aim of the test

-to measure the capacity of a player to be able to move effectively and quickly into a position of predetermined play. For instance, Serve and run into the net.

The Equipment of the test

-tennis court, masking tape, stopwatch and measuring tape.

The Directions of the test

The tennis player begins at the center mark on the baseline. He sprints to doubles sideline to touch a cone placed at the center of the line upon the "go" command of his coach. Then, he returns back to the starting position on the center mark. When the player touches each cone he runs to, he should simulate the correct foot positions that he use on the court for example; for backhand: side on and right foot in front.

Then, from the center mark, he runs to the singles sideline and again touches the cone before returning to the starting position.

The short diagonal at the intersection of the singles sideline and service line on the right-hand side, again returning back to the starting position is the next sprint.

Then, the player sprints forwards to touch the net and return back to the baseline keeping an eye on his opponent and the ball down the other end.

The next direction is the long diagonal to the left (intersection of the net plus left singles sideline).

Then, it is along the baseline to the left singles sideline and back to the start. The player falling short of the 20m line twice in succession has his test terminated and his score recorded when near exhaustion. His score is his level and number of shuttles immediately previous to the bleep on which he was eliminated.

The last sprint is out to the doubles sideline as fast as possible. As the player crosses the doubles sideline, the stopwatch is stopped

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Table 3: Descriptive Statistics and T-Test (Pre-Test) Results of Experimental Group and Control Group for Agility and Speed

Variables	Pre-test		Post-test		Mean Difference	df	T	Sig
	Mean	SD	Mean	SD				
Agility	32.1050	1.29076	30.2392	1.68089	1.86583	11	3.457	.005
Speed	3.3175	.17410	3.3600	.17456	-.04250	11	1.415-	.185

The Test note:

- One trial is performed typically.

Prior to training, the subject had their baseline agility and speed tested. The total testing session was approximately one hour for each subject which included warm-up, ten minute rest times between tests and approximately three minutes between reps. Each test was illustrated and demonstrated. Practice trials were given the subjects to become familiar with the testing procedures before

testing. The pre and post-testing were counterbalanced to ensure that testing effects were minimized.

Statistics:

Descriptive statistics like mean, standard deviation, and t-test was used, and the level of significance was set at 0.05. To analyze the data, SPSS statistical software package was used.

Results:

Table 4: Descriptive Statistics and T-Test Results of Experimental Group for Agility and Speed

Variables	Experimental Group		Control Group		dr	T	Sig
	Mean	SD	Mean	SD			
Agility	31.7475	1.45355	32.1050	1.29076	22	-.637	.531
Speed	3.3208	.19482	3.3175	.17410	22	.044	.965

As shown in table 3, it is found that the results of agility t-test for the experimental group were (Mean ±SD= 31.7475 ± 1.45355) and control group were (Mean ±SD= 32.1050 ±. 1.29076), (t = -.637, df = 22, sig = .531, p< 0.05). On the other hand, the results of the speed t-test for the experimental group were (Mean ±SD= 3.3208 ± .19482) and control group were (Mean ±SD= 3.3175 ± .17410), (t = .044, df = 22, sig = .965, p< 0.05). These results indicated that there are no statistically significant differences in pre-tests in the experimental group and control group scores of agility and speed.

Table 5: Descriptive Statistics and T-Test Results of Control Group for Agility and Speed

Variables	Pre-test		Post-test		Mean Difference	df	T	Sig
	Mean	SD	Mean	SD				
Agility	31.7475	1.45355	27.7075	.81371	4.04000	11	12.187*	.000
Speed	3.3208	.19482	2.3592	.23933	.96167	11	12.010*	.000

*p< 0.05

As shown in table 4, it is found that the results of agility pre-test for the experimental group were (Mean ±SD= 31.7475 ± 1.45355) and post-test were (Mean ±SD= 27.7075 ± .81371), (t = 12.187*, df = 11, sig = .000, p< 0.05). The mean difference of agility in pre-test and post-test was (4.04000). The results of speed pre-test for the experimental group were (Mean ±SD= 3.3208 ± .19482) and post-test were (Mean ±SD= 2.3592 ± .23933), (t = 12.010*, df = 11, sig = .000, p< 0.05). The mean difference of speed in the pre-test and post-test was (.96167). These results showed that there are statistically significant differences in pre-test to post-test scores of agility and speed for the experimental group.

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Table 6: Descriptive Statistics and T-Test (Post-Test) Results of Experimental Group and Control Group for Agility and Speed

Variables	Experimental Group		Control Group		dr	T	Sig
	Mean	SD	Mean	SD			
Agility	27.7075	.81371	30.2392	1.68089	22	-4.696	.000
Speed	2.3592	.23933	3.3600	.17456	22	-11.704	.000

*p< 0.05

As shown in table 5, it is found that the results of agility pre-test for the control group were (Mean ±SD= 32.1050 ± 1.29076) and post-test were (Mean ±SD= 30.2392 ± 1.68089), (t = 3.457, df = 11, sig = .005, p< 0.05). The mean difference of agility in pre-test and post-test was (1.86583). These results showed that there are statistically significant differences in pre-test to post-test scores of agility of the control group. In the case of speed, the results of speed pre-test for the control group were (Mean ±SD= 3.3175 ± .17410) and post-test were (Mean ±SD= 3.3600 ± .17456), (t = 1.415-, df = 11, sig = .185, p< 0.05). The mean difference of speed in pre-test and post-test was (-.04250). These results showed that there are statistically no significant differences in pre-test to post-test scores of speed for the control group.

As shown in table 6, it is found that the results of agility t-test for the experimental group were (Mean ±SD= 27.7075 ± .81371) and control group were (Mean ±SD= 30.2392 ± 1.68089), (t = -4.696, df = 22, sig = .000, p< 0.05). On the other hand, the results of the speed t-test

for the experimental group were (Mean ±SD= 2.3592 ± .23933) and control group were (Mean ±SD= 3.3600 ± .17456), (t = -11.704, df = 22, sig = .000, p< 0.05). These results showed that there are statistically significant differences in post-tests in favor of the experimental group scores of agility and speed.

DISCUSSION:

The study aimed to find out the preparation of proposed exercises on developing the speed of moving towards the net for youth tennis players plus identify the effect of the

proposed exercises on developing the speed of moving towards the net for youth tennis players. The study findings revealed that there were significant differences between the experimental group (proposed exercises) and control group in the agility and speed tests. As indicated in tables 4 and 5, it is found that there was a decrease in agility times for the experimental group and control group from pre to post testing. In pre to post testing agility times, the difference is greater in experimental group than control group. Moreover, there was a decrease in speed times only for experimental group from pre to post testing. Concerning the results in table 6, it is found that there were statistically significant differences in post-tests and in favor of the experimental group (proposed exercises) scores of agility and speed. This showed that proposed exercises (speed, agility and plyometrics) were more effective exercises on developing the speed of moving towards the net for youth tennis players. Paul and Todd (2011) mentioned that performing movement and running drills regularly will help the player to improve his speed and quickness, also allowing him to get to the ball early. (ITF, 2019) recommended that in working with a tennis player, the most successful plyometric exercises are those that are related specifically to the game itself. Plyometric drills are centered on reducing ground contact time. A certain amount of learning must happen to develop a faster reaction to landing plus getting off the ground.

The study showed that there was a significant improvement in speed of moving among the youth tennis players who had subjected proposed exercises (speed, agility and plyometrics). Also, it is indicated that the plyometric training benefits can have on agility. The player can not only use plyometrics to break the monotony of training, but also he can improve his explosiveness and strength during working to become agile [24]. (ITF, 2019) confirmed that in order to become a successful tennis player, it must be able to respond to different sorts of signals and quickly move with constant changes in direction. Thus, it makes perfect sense to integrate agility and speed training. Also, [39] mentioned that tennis success comes down to being able to perform short bursts of movement in multiple directions for an extended period of time. All this has to be accomplished whilst maintaining balance and control over a tennis player body and preparing for his shots.

The current study results demonstrated that the agility training benefits can effect on performance. This improvement in agility is beneficial for athletes who require quick movement while performing their sport. Thus, the results of the current study are agreed with the results of Michael et al., (2006)[24] and Parsons & Jones (1998)[28]. In both studies, the authors used a T-test to determine agility and speed. They found that the tennis player became agile and quicker and that enabling him to be more effective player and get to more balls.

From the results of the current study, it is recommended that if the agility, speed and plyometrics exercises are included in the tennis training movement program, the players will improve their speed and playing abilities.

CONCLUSIONS

The current study results are very encouraging and showed the benefits of the proposed exercises can have on speed. Furthermore, it showed that the proposed exercises helped in improving the physical abilities of the experimental group compared to the control group, which contributed to the improvement of the explosive movement as well as the acceleration and deceleration movement and sudden stops during the performance and that helps the players to move quickly and play the balls near the net correctly. Finally, the results revealed that the speed improvements can occur in six weeks of agility, speed, and plyometric exercises.

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