

E-ISSN: 2709-9369

P-ISSN: 2709-9350

[www.multisubjectjournal.com](http://www.multisubjectjournal.com)

IJMT 2022; 4(1): 168-173

Received: 29-04-2022

Accepted: 13-05-2022

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## **The effect of isokinetic training on types of muscle strength and the level of performance of some skills for tennis players**

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### **Abstract**

The purpose of this paper is to preparation exercises according to the isokinetic style in the types of strength and the level of performance of the skills of serving and the front and background kick for tennis players, and the hypothesis of the research is that there is an effect of the exercises of the isokinetic style on the types of strength and the level of performance of the skills of serving and the front and background kick for tennis players, the experimental approach was used to design equivalent groups on (10) players representing the Misan governorate team. They did the exercises for period of (8) weeks, with two training doses per week. After the end of the experiment, post-tests were conducted, the results were processed, discussed and scientifically supported, and conclusions were reached, including that the isokinetic method works to develop Strength characterized by the speed in the first place and endurance of force in the second degree and does not work to develop explosive power, and accordingly the research recommendation is to focus on such exercises in developing strength distinguished by speed because of their significant impact on that special ability of tennis players.

**Keywords:** Isokinetic, training, muscle, tennis players, skills

### **Introduction**

Modern technologies have contributed to the use of devices for the sports training process, which works to develop physical and skill capabilities or increase the load on the player's muscles by increasing resistance. Some studies interested in training tennis players have indicated the need to use devices to increase resistance without relying on the resistance of the racket only, and that some These training devices work to develop the muscular strength of the working muscles and the direction of movement, including devices that use isokinetic contraction, which works to develop the strength of their types, and since the tennis player needs different types of strength according to skills and a group of special muscles that work to produce movement and the player depends on it in a way It is large, and accordingly, the muscular strength that is specific to each skill must be developed, so the researcher worked on developing exercises according to the isokinetic contraction mechanism of the muscle to develop the type of muscular strength, as the type of muscular strength that the tennis player depends on in performing the serving skill differs from the type of strength he needs in Performing the skill of ground strikes, and the importance of research is evident in preparing exercises according to isokinetic contraction (similar to movement) to develop the types of ground strikes. Muscular strength that tennis skills need while playing and identifying the impact of the development of types of muscle strength on the level of serving skill and the skills of the front and background strikes.

### **Research problem**

Through the field follow-up of the Iraqi championships and training units for tennis players and the researcher's practice of this type of game, the researcher noticed the lack of application of the muscular method similar to movement (isokinetic), which works to develop the muscular strength of the muscle groups working in the movement and in the direction of movement, and the trainer's dependence on the vocabulary of the traditional training curriculum (i.e. training the tennis player using weights, iron bars and a bridle device), which is one of the reasons that led to the stability in the level of achievement, so the researcher decided to develop exercises in the isokinetic style to develop the types of muscle strength (strength characterized by speed, endurance strength, explosive power) required to perform skills Tennis and knowing the extent to which this development affects

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the types of strength of the muscles working in the performance of the serve skill and the two skills of the front and back groundstrokes.

### Research objective

- Preparing exercises according to the isokinetic training method to develop the endurance of strength and strength characteristic of speed and explosive power and the level of performance of the serving skills and the front and rear ground strikes in the research sample.
- Recognizing the effect of the isokinetic training method in developing the endurance of force and strength characteristic of speed and explosive power and the level of performance of the serving skills and the front and rear ground strikes in the research sample.

### Research hypotheses

- There is an effect of the isokinetic training method in the development of strength endurance and strength characterized by speed and explosive power and the level of performance of the serve skills and the front and background strikes.

### Research fields

- Human field: Misan International Stadium
- Time field: (20/3/2021) to (20/6/2021).
- Spatial field: Misan governorate players.

### Research methodology and field procedures

#### Research Methodology

The researcher used the experimental method in the style of equal sums with two tests, before and after, because it is commensurate with the nature of the study procedures, "and given that the experimental research is characterized by precision and control over the studied variables so that in some of them there is an intentional change and controls other variables, it is considered the only research method that explains the relationship between the effect the reason is precise "(Allawi and Ratib. 1999) <sup>[10]</sup>.

#### Community and sample research

The research community was determined by the comprehensive inventory method, which "is chosen freely on the basis that it achieves the purposes of the study carried out by the researcher" (Thouqan Obeidat *et al.* 1988) <sup>[16]</sup>.

The research community is represented by the players of the Misan Governorate team, and their number is (8) players distributed into two experimental and control groups through a simple random lottery to be (4) players in each group.

#### Means of collecting information used equipment and research tools

##### Means of collecting information and equipment used

- Arab and foreign sources.
- Personal interviews with experts and specialists.
- Self-observation by the researcher.
- Data blanking forms.
- Tennis court plus rackets and balls.
- Ball shooter with different speeds.
- High-speed cameras.

#### Research Tools

- Test and measurement.

### Field research procedures

#### Identify the research variables and their tests

The research variables and their tests were identify after they were presented and discussed with some specialists in the field of sports training and tennis. The tests were as follows:

#### First: strength characterized by speed of the two arm:

- Test name: Flexion and extension of the arms from the prone position (10) sec (Hassanein. 1987) <sup>[11]</sup>.
- Purpose of the test: To measure the speed characteristic of the muscles of the arms and shoulders.
- Tools used: stopwatch, whistle, registration form.
- Test procedure: The tester takes the front-facing position on the ground so that the body is in a straight position at the start signal. The tester bends and extends the arms completely, provided that he continues to repeat the performance for the largest possible number of repetitions and without stopping for a period of (10) seconds.
- Recording: The laboratory score is the number of correct repetitions within a period of (10) seconds.

#### Second: The strength endurance test for the arms

- Test name: Inclined prone and flexed arms. (Hasnawi. 2008) <sup>[13]</sup>.
- Purpose of the test: To measure the muscular endurance of the arms and shoulders.
- Tools used: it does not need tools; it is performed on flat ground.
- Description of performance: The tester takes an inclined prone position on the ground so that the body is in a straight position and does not have a downward or upward curvature.
- The sample repeats this performance as many times as possible without stopping until fatigue.
- Recording: The sample continues to bend and extend the arms without resting or stopping to record the largest number of bending and extending the arms until fatigue.

#### Third: The explosive power test of the two arms

- Throwing a medical ball weighing (1) kg with one hand over the head from a sitting position on a chair.
- Purpose of the test: To measure the explosive force of the arms and shoulders.
- Tools: a medical ball weighing (1) kg, a measuring tape and a chair with a strap that fixes the torso and is tight.
- Description of performance: the sample sits on a chair, two hands above the head carry the medical ball, and the torso is adjacent to the edge of the chair. The belt is placed around the laboratory stem and is held from the back by a tight grip for preventing the laboratory from moving forward while throwing the ball with two hands so that the process of throwing the ball is done with hands only without using the trunk. Each laboratory has three attempts, scoring the best of them.
- Recording: The distance between the front edge of the chair and the nearest point the ball places on the ground is calculated.

#### Fourth: Test the skills of the front and background strike (Hashem and Kazar. 2013) <sup>[3]</sup>.

- Test name: Test the accuracy and strength of the ground, front and back strikes.

- Purpose of the test: to measure the accuracy and power of the forehand and backstrokes.
- Performance specifications
  1. At the beginning of the test, it must be ensured that the participants have completed their warm-up and are ready to take the test.
  2. (6) Balls awarded to the player from both sides, one in the front and the other in the back...etc. The player must hit the ball inside the individual court in a straight line as shown in the drawing.
  3. Six other balls are awarded to the player from both sides, one in the front and the other in the back...etc. The player must hit the ball diagonally inside the individual court as shown in the drawing.
  4. Evaluation points are calculated in light of the place where the ball falls in the first rebound for accuracy and the second rebound for the force of the strike.
  5. The assistant player must throw the ball in the middle of the area between the service line and the base line, as indicated by the drawing. The hitting player has the right to reject the irregular ball that falls outside the correct area.

#### **Ground kick accuracy points**

1. One point when the ball falls in any area of the center outside the planned target areas.
2. Two points when the ball falls into the accuracy target area before the service line.
3. Three points when the ball falls inside the accuracy target area in the accuracy back target area and on the tennis single court as indicated in the drawing.

#### **Hitting Points Scoring**

1. One point in the second bounce behind the baseline and before the second strength zone line.
2. The points are doubled in the second rebound of the ball when it falls in the far ball area, and an example of the first case: If the ball falls in the area (3) on the field and rebounds again outside the field and in an area behind the baseline, the number of points becomes (4) and an example of the second case: If it falls The ball is in the zone (3) on the court and rebounds again in the zone of strength, the number of points is doubled and becomes (6).
3. The player gets a (zero) when the ball falls in the first rebound outside the singles tennis court.
4. Stability in hits: The player is awarded one extra point for each correct hit without a mistake.
  - Score Calculation: All points are collected and the highest possible score a player can reach in this test = 84 points for accuracy and strength (36 for accuracy + 48 for strength). Point.

#### **Fifth: Testing the power of the serve in tennis**

- Test name: The Kuban Tennis Service Strength Test (Jawad. 2002) <sup>[2]</sup>:
- Purpose of the test: To measure the strength of the serve.
- Tools used: (one racket with each tester, 24 balls, and a tennis court divided as follows).
- Procedures: A line is drawn parallel to the baseline and divides the area between the transmission and the baseline into two equal halves of 9 feet each, and

another line is drawn parallel to it and 10 feet behind the base.

- Action Limitation: The scorer notes the balls and records the correct attempts - the assistant collects the balls and returns them to their box.
- Performance description: The player stands behind the baseline on the right side of the court (and vice versa for a left-handed player). The tester sends 14 balls directed to the correct serve area.
- Scoring: Balls falling outside the correct serving area are scored for a score (zero).
- Balls falling outside the correct serving area are scored for the 2 degrees if the next rebound of the ball is in the service area or the 9 feet area behind it, and 4 degrees are scored for them if the next rebound of the ball is in the area between the 9 feet line The baseline is scored for it 6 degrees in the event of the ball rebounding between the baseline and the 10-foot line located behind it, and 8 degrees are recorded for it in the event of the ball rebounding behind the 10-foot line.
- The balls that fall over the lines score the highest value.

#### **Exploratory experience**

The exploratory experiment is defined as a preliminary experimental study carried out by the researcher on a small sample before carrying out his research in order to test the research methods and tools (Arabic Language Academy. 1984), and it was conducted on 3/20/2021 on (2) players from the sample.

#### **Pre-tests**

The pre-tests were applied to the research sample in its control and experimental groups on Misan Governorate Stadium on Thursday 15/4/2021 at exactly three o'clock in the afternoon with the help of a work team.

#### **Main experiences**

The application of special exercises to the experimental group was started on Sunday, corresponding to 04/18/2021, where the first training dose of the (16) training dose was distributed over eight weeks with two doses per week, on Sunday and Wednesday, and ended on Sunday, corresponding to 9/6/2021, as during the main experiment, isokinetic exercises were applied, in which the focus was on developing the types of strength for the players through exercises similar to the performance of skills (serving and forehand and backstrokes) for tennis players. Bodybuilding halls using the special equipment for this, and the application of those exercises to the experimental group within the special preparation stage was also in the main part of the training dose whose training goal is similar to the training goal of the exercises, which is to develop the types of strength for tennis players, which are (Performing the skill of the serving on the pull-back device (isokinetic) performing the skill of the front strike on the side pulling device (isokinetic) performing the skill of the back blow on the side pulling device (isokinetic)) As for the control group, they applied the program prepared for them by the trainer, as the number of exercises reached Isokinetic (8) exercises by (4) exercises in each training dose, where the exercises of each dose differ from the next dose in order to apply the rule of change, as well as repetition by repeating the exercises of a dose on Sunday for every two weeks in order to achieve adaptation in the players, and so on until

the end of The experiment also, the researcher deliberately applied the exercises accurately and linked them with the skill performance in some of the exercises.

**Post-tests**

After completing the exercises on the research sample, the post-tests were conducted in a similar way to the pre-tests, in order to know the level reached by the research sample in the studied variables. The results of the tests were statistically processed by the researcher to identify the nature of the differences between the two groups because of

the experimental group's application of exercises during the main experiment period.

**Statistical methods:** The search data was processed through the Statistical Package for the Social Sciences (SPSS).

**Presentation, analysis and discussion of the results of the pre and post-tests of the research variables of the control group**

**Table 1:** Shows the arithmetic means, standard deviations, the calculated (t) value, the level of error, and the significance of the differences between the pre and post-tests of the control group in the research variables.

Variables	Measuring unit	Pre-test		Post-test		T value	level Sig	type Sig
		Mean	standard deviation	Mean	standard deviation			
The speed characteristic of the arms	Repetition	11.33	1.37	12.33	1.25	3.90	0.03	Sig
Endure the strength of the arms	Repetition	33	8.74	36	5.71	3.52	0.01	sig
Explosive power of the arms	Meter	6.15	1.19	6.16	0.96	0.64	0.07	Non sig
Accuracy and power of the front and back strikes	degree	55	4.36	58.5	5.45	4.25	0.01	sig
serve	degree	66	3.45	69.6	3.60	3.98	0.04	sig

Looking at Table (1), we find a noticeable positive development through the differences between the values of the arithmetic means of the tribal and dimensional tests for all search variables and in favor of the post-tests, as well as the values of the (T-Test) law calculated for the corresponding samples, whose significance levels for all variables, came less than (0.05), which means that the differences are significant in favor of the post-tests, and accordingly, what the researchers assumed in the second hypothesis have been achieved.

The researchers attribute the reason for the significant differences in the control group in the post-tests in all variables of the research, to the exercises that the control

group applied during the main experiment prepared by the trainer, which served the training objectives for which it was set, as well as being codified according to the principles and foundations of sports training in terms of components Training loads and forms that target strength, and all scientific sources confirm that muscular strength is of special importance, as Kamal Al-Rabadi states that “strength is the basis of movement through which a person can move or resist something” (Rabadi. 2001)<sup>[6]</sup>.

**Presentation, analysis and discussion of the results of the pre and post-tests of the research variables for the experimental group**

**Table 2:** Shows the arithmetic means, standard deviations, the calculated (t) value, and the level of error and the significance of the differences between the pre and post-tests of the experimental group in the research variables.

Variables	Measuring unit	Pre-test		Post-test		T value	level Sig	type Sig
		Mean	standard deviation	Mean	standard deviation			
The speed characteristic of the arms	Repetition	11.83	1.30	16.83	1.47	8.24	0.00	Sig
Endure the strength of the arms	Repetition	33.83	12.67	40.16	14.60	3.67	0.01	sig
Explosive power of the arms	Meter	6.17	0.70	6.20	0.38	2.20	0.06	Non sig
Accuracy and power of the front and back strikes	degree	56.75	5.33	62.50	5.90	7.50	0.00	sig
serve	degree	66.40	4.28	73.60	4.57	10.61	0.00	sig

Significant below a significance level less than or equal to (0.05) at a degree of freedom(3)

Looking at Table (2), we find a noticeable positive development through the differences between the arithmetic mean values of the tribal and dimensional tests for all search variables and in favor of the post-tests, as well as the values of the T-Test law calculated for the corresponding samples, whose significance levels for all variables, came less than (0.05), which means that the differences are significant in favor of the post-tests, and thus what the researchers assumed in the second hypothesis was achieved.

The researchers attribute the significant differences that appeared in the post-tests of the experimental group and all research variables, to the isokinetic exercises similar to movement that were applied using special devices, and that these devices provide the motor path similar to movement,

to give “maximum muscle contraction that takes place at a constant speed during the full range of movement “ (Allawi and al-Fattah. 1997)<sup>[1, 8]</sup>, as this type of training is characterized by the possibility of using movements as close as possible to those performed during performance” (Fattah. 1997)<sup>[1, 8]</sup>, and this type of training “works to activate the largest number of motor units and as a result we will find that the working muscles face a training load.” It is greater than other forms of contractions” (Abdel-Dayem *et al.* 1993)<sup>[7]</sup>, which is reflected on the special abilities of the tennis player, including the strength characterized by speed, explosive power, and endurance of force to be positively affected as well as the skills of the front and back ground strike and the serve when the player performs, and this is what happened in the post-test of the aforementioned studied variables.

## Presentation, analysis and discussion of the results of the post-tests of the research variables for the control and experimental groups

**Table 3:** Shows the arithmetic means, standard deviations, the calculated (t) value, the level of error, and the significance of the differences between the two post-tests for the two groups in the research variables.

Variables	Measuring unit	Pre-test		Post-test		T value	level Sig	type Sig
		Mean	standard deviation	Mean	standard deviation			
The speed characteristic of the arms	Repetition	12.33	1.25	16.83	1.47	6.37	0.00	Sig
Endure the strength of the arms	Repetition	36	5.71	40.16	14.60	7.33	0.00	sig
Explosive power of the arms	Meter	6.16	0.96	6.20	0.38	1.70	0.06	Non sig
Accuracy and power of the front and back strikes	degree	58.5	5.45	62.50	5.90	6.87	0.00	sig
serve	degree	69.6	3.60	73.60	4.57	7.88	0.00	sig

Significant below significance level less than or equal to (0.05) at the degree of freedom (6)

Looking at Table (3), we find a noticeable positive development through the differences between the arithmetic mean values of the dimensional tests for all the research variables and in favor of the experimental group, as well as the values of the T-Test law calculated for the independent samples, whose significance levels for all variables, came less than (0,05). This means that the differences are significant in favor of the experimental group, and accordingly, what the researchers assumed in the second hypothesis have been achieved.

The two researchers attribute the significant differences in the post-tests between the two groups, which came in favor of the experimental group and all the research variables. As for the experimental group, the researcher attributes the reason for this development to the following:

1. The nature of the exercises used
2. Components of the training load of the training curriculum used

As the exercises that the researcher used are isokinetic exercises (similar to movement) using special devices that had a great impact on developing the speed-distinguishing strength of the arms and legs, as (Hossam El Din. 1994) [14] mentions that “the growth of muscle strength using isokinetic training exceeded the rest of the types” (Fattah. 1997) [1, 8]. This was in agreement with what (Abdel-Dayem *et al.* 1993) [7] said, “The rate of strength gained using isokinetic exercises is more than isometric exercises and isotonic exercises” [11], and this indicates the extent to which this type of training affects the development of muscular strength, and which confirms the extent of the effect of isokinetic training on strength, the researchers presented “by conducting a research on four groups, each group using a type of training (isokinetic, isotonic, isometric, and control), and the effect of isokinetic training on strength development was proven more than the rest of the types” (Fattah. 1997) [1, 8]. And the development of muscular strength increases the ability of the muscle to overcome different resistances during a certain time, as “the movement is always based on working against resistance and when the muscle is more powerful, the obstructing effect that Caused by the different resistances, the speed decreases, and then the performance increases in the specified time” (Abdel-Dayem *et al.* 1993) [7], and this explains to us the reason for the development of the experimental group in the two tests of strength characterized by speed due to the development of muscular strength for this group more than the control group.

The force characterized by speed is composed of the component “force and speed” (Abdel-Dayem *et al.* 1993) [7], it is the sum of “force x speed” (Hossam El Din. 1994) [14] and since it consists of “the component of force and the

component of velocity, it can increase by increasing the component of strength or increasing the component of the speed of muscle contraction, Or increase both components, and usually the best way to increase it is to increase the strength component” (Hussein and Nassif. 1987) [12], and this is what the researcher worked on as he designed the curriculum to develop the strength characterized by speed, with an emphasis on performance at the maximum speed and at the same speed as the performance in serve or my front and back skills, Pipes and Wilmore (Allawi and Nasr al-Din. 1982) proved that there is a difference in the level of muscle strength development between isotonic and isokinetic training, as they conducted a research on four groups, a group that used isotonic training and the other isokinetic at low speed, the third group is isokinetic at high speed, and the fourth group is a control group. The isokinetic training with the growth of strength endurance the third group that trained by the isokinetic at high speed, in general, recorded the high benefit in training.

This explains to us the reason for the development of the experimental group in the tests of strength characterized by speed and endurance of force, and the absence of moral differences between the two groups in the explosive power, which is clear that the method of isokinetic training does not serve the explosive power according to the results of the research and the interpretation of scientific sources.

### As for the development of the studied skills, the researcher attributes this development to the following:

Development in the strength characteristic of speed and endurance of the muscles working when performing.

The development that took place in the strength characterized by speed and endurance of the muscles working at serve and when performing the two skills of the front and background strike for the experimental group, “as the focus on exercises in which the same muscle groups are used in the performance is more effective and beneficial” (Khaleq. 1999) [4]. which was Because of the prepared exercises, as “the speed characteristic of the arms is one of the important factors for playing tennis” (Helmy and Jaber Bariqa. 1997) [5], and the reason for the effect of the force distinguished by speed on the strength of serve, the forehand and the floor is that the greater the strength of the arms during the performance, the greater the performance strength of the tennis player.

## Conclusions and recommendations

### Conclusions

- The isokinetic exercises used in the research had an effective effect in developing the strength characteristic

of speed and endurance of force for the arms of the tennis player.

- The development of the strength characteristic of speed and endurance of the force of the tennis player, and similar to the motor path of the skills, have a positive effect on the development of the force of striking the tennis ball, and this is provided by the isokinetic exercises that work on the working muscles and in the same angles of muscular work, which gives more effectiveness to the force.

### Recommendations

- Applying the exercises used in the research to other samples of tennis players in order to benefit and support the training process.
- Conducting other research to find out the effectiveness of using other training methods (high-intensity interval and fartlek).
- Work on the introduction, innovation and modification of training devices that provide the same kinetic path of effectiveness in training tennis and other activities, due to the effectiveness of these devices in developing the muscular strength of the muscles working effectively.

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