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THE INFLUENCE OF FUNCTIONAL TRAINING ON BIOMOTOR SKILLS IN TENNIS PLAYERS

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ABSTRACT

Background: Functional training contributes to different systems of the body with functional exercises in different parts of the body (covering the whole body, developing universal motor skills, applied in multiple motion planes) through intensive, short and constantly changing sessions. Functional training, simultaneously increasing athletes' muscular endurance, hypertrophy, power and strength, also creates an excellent impact to improve aerobic power and anaerobic capacity. **Aim:** Aim of the study is to find out the influence of functional training on biomotor skills in tennis players. **Objective of the Study:** To Evaluate the Effectiveness of Functional training on Biomotor skills in Tennis Players by using biomotor performance components, including the10-m Speed Test, Vertical Leap Test, Sit down Test, Grip Force Test, Agility Test (T Test) and Anaerobic Power test. **Method**: The study was continued with 10 persons in CG and 10 persons in EG. Volunteer participants were selected from tennis club; Girl athletes between 14–18 years old who had been playing tennis for at least 6 months were preferred. Group A was given 8 weeks of routine training program and Group B was given 8 weeks of Functional training program. **Data Analysis** was done prior to the beginning of the training session and post assessment done at the end of 8 week. **Result:** When comparing the pre-test–post-testvalues in terms of inter-group which applied the 8-week routine tennis and functional training program, a significant difference was found in favour of the experimental group. **Conclusion**: The present study concluded that, functional training is effective in improving biomotor skills in girl tennis players.

Keywords: Biomotor ability, Functional training, Tennis player.

INTRODUCTION

Functional training contributes to different systems of the body with functional exercises in different parts of the body (covering the whole body, developing universal motor skills, applied in multiple motion planes) through intensive, short and constantly changing sessions. In the literature, practices created as a form of functional training have different resting rates with similar training content (gymnastics, weight lifting, aerobic exercises, etc.). Along with functional training capacity, muscle endurance is associated with strength and a positive increase in body composition with the potential to increase strength. While endurance largely depends on the aerobic capacity of the athlete, it is less dependent on anaerobic capacity. Functional training, while simultaneously increasing athletes' muscular endurance, hypertrophy, power and strength, also creates an excellent impact to improve aerobicpower and anaerobic capacity.

Success in tennis depends on numerous factors such as physical condition, technical skill and tactical strategy. The physiological requirements of tennis are quite complicated because it covers all of the strength, short distance runs and endurance exercises in the game. With this aspect, controversy among many sports scientists, tennis coaches and players continues as regards the implementation of training programs. In this way, the question of which aerobic or anaerobic energy systems are dominating tennis is addressed. Thequestion is examined in five sections according to the contextual structure of the basic motor qualities. The first three are basic and the other two are complementary. These qualities include strength, speed, flexibility, mobility, and coordination. The basic motor qualities of an individual consist of the elements that determine the person's bodystrength and ability and the degree of complex motor power. These qualities are the basis and the primary condition for every motorsports movement performed during the functional training process. The development of basic motor features in all sports is an indispensable part of the applied training. Kinematics and the associated factors of performance are essential for trainers to help the player to develop his/her skills and to improve performance.

While specific training is planned to develop a specific area or a specific feature, combined training aims to co-develop the basic biomotor qualities. Especially in combined training, it is a prerequisite to work in strength, speed, endurance, technical and tactical integrity. Functional training, both to improve strength characteristics and to train in a unity with flexibility, speed, endurance, mobility and coordination has been aimed. The idea was that the development of all these biomotor qualities in sports development could be done in single training. It is designed to increase the quality and sports performance of daily life activities. It targets the neuromuscular system; namely, it trains not only muscles, but also movements. It involves functional training, dynamic and static balance, and challenges to improve coordination and proprioception, using a staged and individualized program in a multi- joint and multi-plane exercise program. In this study, it is presumed that functional training to be performed according to the branch-specific age period will increase the functional capacity of the athletes and further increase their sports performance in the future.

AIM

Aim of the study is to find out the effectiveness of functional training on biomotor skills in tennis players

OBJECTIVE OF THE STUDY

To Evaluate the Effectiveness of Functional training on Biomotor skills in Tennis Players by using biomotor performance components, including the10-m Speed Test, Vertical Leap Test, Sit down Test, Grip Force Test, Agility Test (T Test) and Anaerobic Power test.

MATERIALS AND METHODOLOGY

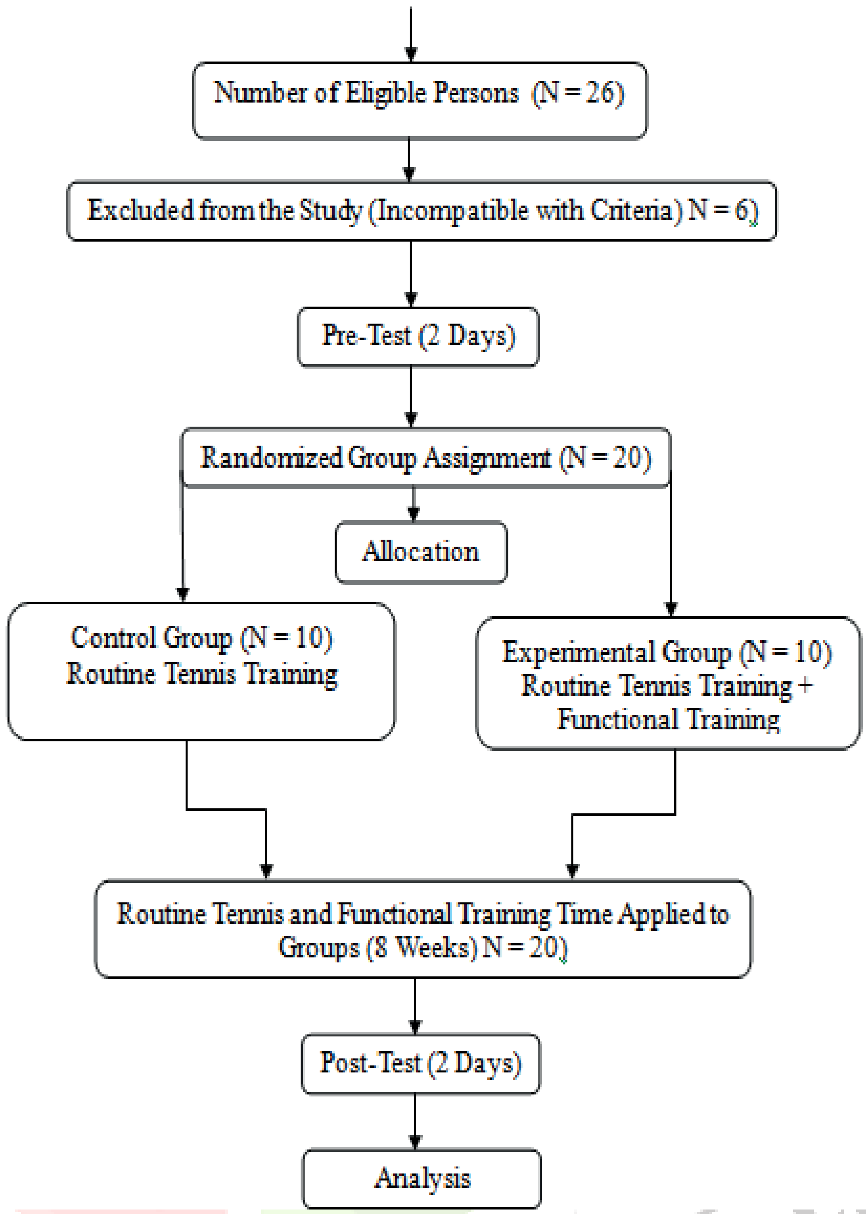
Materials used:

1) Digital Hand Dynamometer
2) Stop watch
3) Measuring Tape
4) Agility Ladder
5) Flat wall
6) Mat
7) cones

PARTICIPANTS

Participants were informed about the issues, potential risks and benefits before participating in the study, and written informed consent was obtained for their participation in accordance with the Helsinki Declaration's policies and procedures. Written consent was also approved by the parents of all minors participating in the study. Volunteer participants were selected from tennis clubs Girl athletes between 14–18 years old who had been playing tennis for at least 6 months were preferred.

Research Procedure



The study was continued with 10 persons in CG and 10 persons in EG. A presentation including the details of the training program was madeby giving information about the aims of the study, research design, training program, measurement procedure, participant responsibility to the participants and their parents. Participants were allowed to participate in the first measurements and continue training regularly. The measurement procedure was introduced in detail to each subject, and a summarized information package scribing their responsibilities to participate in the training program was delivered. Participants from both groups were provided with regular diet and exercise routines.

RESEARCH MODEL

In the study, an experimental model with a control group including pre- test–post-test measurements was used. Participants were divided into the control group (CG) and the experimental group (EG) by randomized appointment. The routine tennis training program was applied to the control group of tennis players participating in the study, 90minutes a day, 4 days a week for 8 weeks. The 2+2 (2-day routine tennis training and 2-day functional training) program was applied to the experimental group of tennis players for 4 days a week,90 minutes a day for 8 weeks

RESEARCH TOOL – TESTS APPLIED BEFORE THE TRAINING PROGRAM

BIOMOTOR PERFORMANCE MEASUREMENTS

The variables of the study were composed of biomotor performance components, including the 10m Speed Test, Vertical Leap Test, Sitdown Test, Grip Force Test, Agility Test (T Test) and Anaerobic Power. The tests of both groups were carried out as a pre-test at the beginning and post-test at the end of the study. Participants were taken to the test after a warm-up of 5-minute light pace running and then 5minutes of stretching exercises for each test.

10-MSPEEDTEST

The participants speed performance was measured using a stopwatch in the area marked with a distance of 10 meters. At the starting point,the athlete took a standing position with one line in the front and the other in a linear standing static position. No swinging was allowed in anyway. Between each run, athletes were given complete rest and asked to do 3 maximum repetitions. The best time was recorded.

VERTICAL LEAP TEST

Vertical Leap is measured as the vertical jump value of the individual by measuring the difference between the most extreme point that a person can reach by stretching the arm against the wall and the highest point she can touch by jumping. The measurement was repeated three times and the highest value was recorded for analysis.

SIT-AND-REACH TEST

Athletes' flexibility was evaluated by the sit-and-reach test. Athleteswere in a long sitting position with both knees in full extension, ankles at 90degrees and their feet bar.

Athletes were asked to lean forward as long as they can with their hands in front of their bodies without bending their knees and wait 2 seconds at the last point they can reach. The difference between baseline and the reach was measured in centimeters (cm). The measuring person stood next to the participants and prevented their knees from bending. The measurement was repeated three times and the highest value was recorded for analysis.

HAND GRIP STRENGTH TEST

The right hand-grip forces of the athletes included in the study were measured before and after the training with the help of a hand dynamometer. Dynamometer, resistant to 90 kg / 198lb resistance). Hand grip force measurements were performed with the arms hanging down and a tan angle of 180degrees without bending the elbow. Force measurements were repeated here times, the arm without measurement did not receive

Support from anywhere.Themeasurement of each athlete was performed by calibrating the dynamometer and adjusting the dynamometer according to the hand and finger characteristics of the athlete.

AGILITY TEST (TTEST)

Agility performance was measured using a stopwatch on the track prepared for athletes. The “T” test is an agility test that requires running forward, sideways and backwards for athletes. Equipment needed for this test includes meters, sign cones, stop watch and timing lines. When the athlete felt ready while waiting for both fee to be behind the starting line (point A),she exited and ran from the "A “cone to the "B" cone with a straight run and touched the cone with her right hand. Then sheran leftto the "C" cone with a side run and touched the "C" cone with her left hand, and then she ran to the right to the "D" cone with her right hand. Then she came to the "B" cone, came with a side run and touched it with her left hand, then returned to the "A" cone with a back run. As soon as she reached the "A" cone, the stop watch was stopped and the duration was recorded. In this study, the participant performed 3 repetitions with full rest and the time obtained at the end of the test was recorded in seconds.

HOPPING - Anaerobic Power Test

Anaerobic powers of the experimental and control group athletes were evaluated with the hop test. The number of hops is recorded for every 60 Seconds.

PROCEDURE

Applied Training Procedure

Both training programs in the research consisted of three phases:

1. Warm-up phases (running and dynamic stretching exercise) 15min.
2. The main exercises (loading) phase 60 min.
3. Active Cooling Phase (running and static stretching exercise) 15min.

Routine Tennis Training Program

The routine tennis training program, which both groups practiced, was initiatedwith a 15-minute warm-up phase and completed with a 15-minute cool-down phase after the60-minute main phase, where tennis-specific stroke techniqueswere applied. In this training, the athletes were asked to play with an estimated power intensity of 75%. The participation of athletes in the training program for 8weeks was ensured with their coaches’ support. Throughout the training, the durations and resting frequency in the program was adhered to in the way specified to the athletes.

TABLE 1 8 WEEKS ROUTINE TENNIS TRAINING PROGRAM

Day 1	Manual low-ball feed, 100 forehand (Fh) strokes onthe incoming ball. Manual low-ball feed, 100 backhand (Bh) strokeson the incoming ball. Flat feeding with racket, spinning incoming ball 100Fh. strike. Flat feeding with racket, spinning incoming ball 100Bh. strike. Baseline 100 cm long hand feed from the front ofthe obstacle, high spin on the incoming ball, 100 Fh. strike. Baseline 100 cm long hand feed from the obstacle,high spin on the incoming ball, 100 Bh. strike. Midi field-to-field "drive vole" training 100 Fh. strike. Midi field-to-field "drive vole" training 100 Bh. strike. Feeding the "slice" from the opposite field with the racket, spinning the incoming ball 100 Fh. strike. Feeding the "slice" from the opposite field with the racket, spinning the incoming ball 100 Bh. strike.
Day 2	Cross forehand rally in the height-increased net, Cross backhand rally in height-increased net, Parallel forehand rally inthe height increased net, Parallel backhand rally in the height-increased net, Mixed rally in an increased height net.

Day 3	Low ball feed in front of the net, spinning the incoming ball, 100 forehand strokes Low ball feeding in front of the net, spinning the incoming ball, 100backhand strokes 100 forehand strokes “drive volley” on the low ball inthe mini field 100 backhand strokes “drive volley” on the low ballin the mini field
Day 4	The service boxes of the field were closed, and deep ball exercises were applied to the baselinewith mixed techniques.

While this study was carried out for 8 weeks, different direction and intensity hitting techniques were used for different angles of the court, andenrichment of the study was considered. The direction and intensity ofball feeding techniques were changed from time to time. By hand orracket flings, bouncing and feeding with mixed techniques, the athletes were asked to respond to the incoming balls with mixed, circular strokes. With similar studies, while athletes were sometimes directed to a target, from time to time, short or long balls of different heights were thrown. On the last training day of the fourth and eighth weeks of the program, some analysis and evaluations were made by monitoring the athletes within- point matches.

Functional Training Program

2-day functional training program was prepared in addition to the 2-day routine tennis training program (Table 2), and for this training program the maximum heart rate was75% and above. It was delivered by the researcher for 8 weeks according to the athletes' performance. The prepared training program was chosen from movements that complement

The kinetic chain and improve the athletes 'biomotor skills. These movements are made up of exercises for muscles and muscle groups used in kicking techniques such as pushing, pulling, rotation, squatting, getting up and jumping, and forming the kinetic chain of this technique. These athletes also continued the irroutine tennis training programs.

8-WEEK FUNCTIONAL TRAINING PROGRAM (A SAMPLEWEEK)

EMENT	SET- NUMBER OF REPITITIONS DURATION	REST TIME BETWEEN	MOVEMENT DESCRIPTION
Burpees	3 sets 10repetitions	3 mins	Push-up position is taken with the hands on the bosu ball. While the two knees are pulled towards the abdomen, it jumps up in the vertical plane. While

Bungee Run	once to eachdirection	3 mins	At baseline, the athlete is stopped at the service point facing the net. A bungee band is attached to the waistband. The athlete sprints towards the net. She then runs back in the same direction. When she reaches the starting point, she runs to the right couples corridor, and then to the left couples corridor, with the side sliding steps towards the beginning.
Forward Jump Squat	set 10 repetitions	3 mins	12 and 22 lbs resistance resistant power bands are added to each other, and 22lbs are attached to the athlete's waist. While holding on one end, the athlete on the other end leaps forward to squat and completes the motion by jumping over and over again.
Plank	3 sets maximum durability time	3 mins	Two arms, elbows and forearms are placed on the floor with the mat. Feet are placed on the ground in the push-up position and they are expected to be fixed. With the command accompanied, the right arm is lifted from the ground after 15 seconds. Every 15 seconds, the left arm, right leg and left leg are lifted off the ground, respectively. Finally, the cross arms and legs are

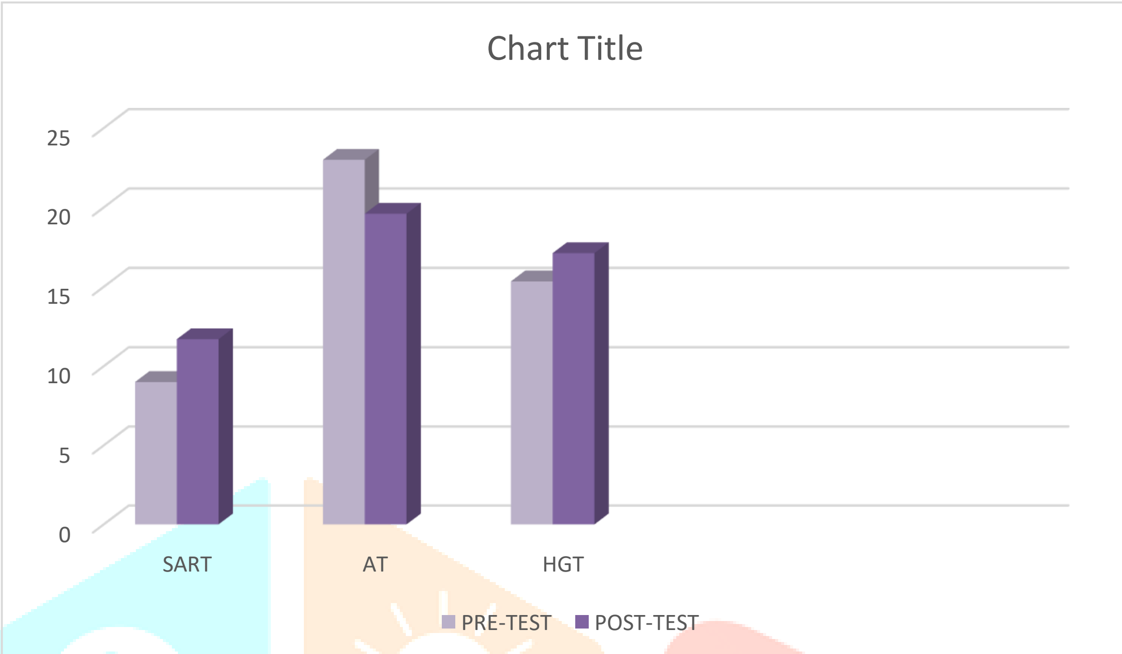
Torso Rotation	3 sets right 10 – left 10repetitions	3 mins	Sliding steps are made between 2 conic heads placed at a distance of 3 meters. When it comes to the conic head, the right and left sides of the athlete are fed with a medicine ball. The athlete is asked to throw back the medicine ball by imitating

Side To Side Run	3 sets 5 repetitions	3 mins	The athlete stands between 5 conic heads lined up half a meter apart and a racket put on the ground at a distance of 2.5 meters. A tennis ball is placed on each conic head. The balls on
Agility Run	3 sets 7 repetitions	3 mins	Front-to-front, inside-side front, right and left front- back runs on agility ladder
Side To Side Crash	sets 10 right 10 left repetitions	3 mins	While the athlete is standing, she raises the medicine ball left and right overhead, hitting hard.
everse Walking	3 sets 7 repetitions	3 mins	The athlete puts her hands on the floor while standing with her back facing the wall at a distance of 1-1.5 meters. She steps up with her feet using the wall and lowers

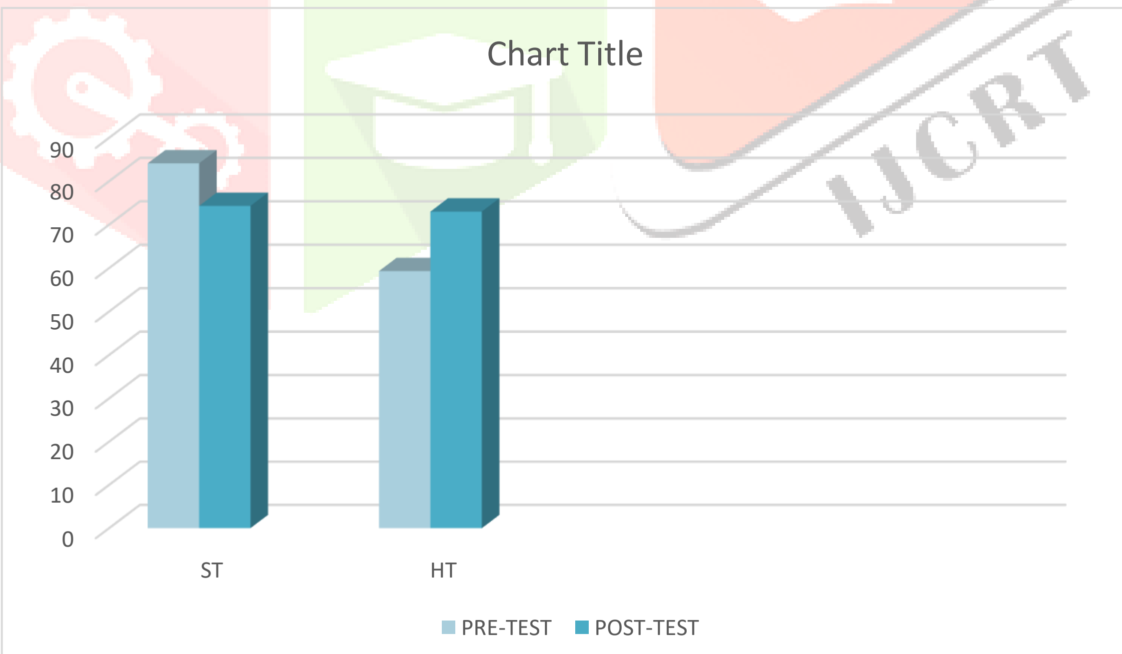
TABLE 1 REPRESENTS PRE AND POST VALUES OF CONTROL GROUP

TOOL	N	MEAN		SD		df	Stderr.df	T value
		pre	post	pre	post			
SART	10	9.00	11.70	1.70	2.16	9	0.260	10.37
AT	10	23.00	19.60	1.83	1.26	9	0.640.427	7.96
HGT	10	15.34	17.12	1.80	1.43	9	0.216	8.24
ST	10	84.10	74.30	3.48	4.90	9	1.20	8.16
HT	10	59.30	73.00	6.58	2.94	9	1.69	8.09
VJ	10	1.97	2.40	0.27	0.37	9	0.03	11.72

GRAPH 1 REPRESENTS PRE AND POST MEAN VALUES OF SART,AT, HT OF CONTROL GROUP



GRAPH 2 REPRESENTS PRE AND POST MEAN VALUES OF ST AND HT OF CONTROL GROUP



GRAPH 3 REPRESENTS PRE AND POST MEAN VALUES OF VT OF CG

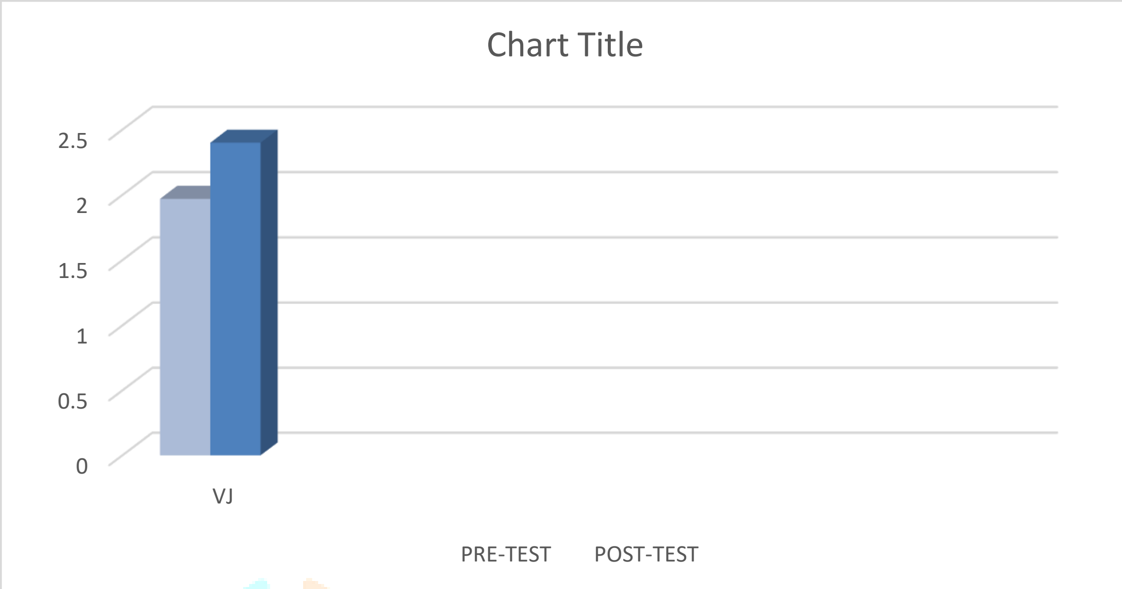
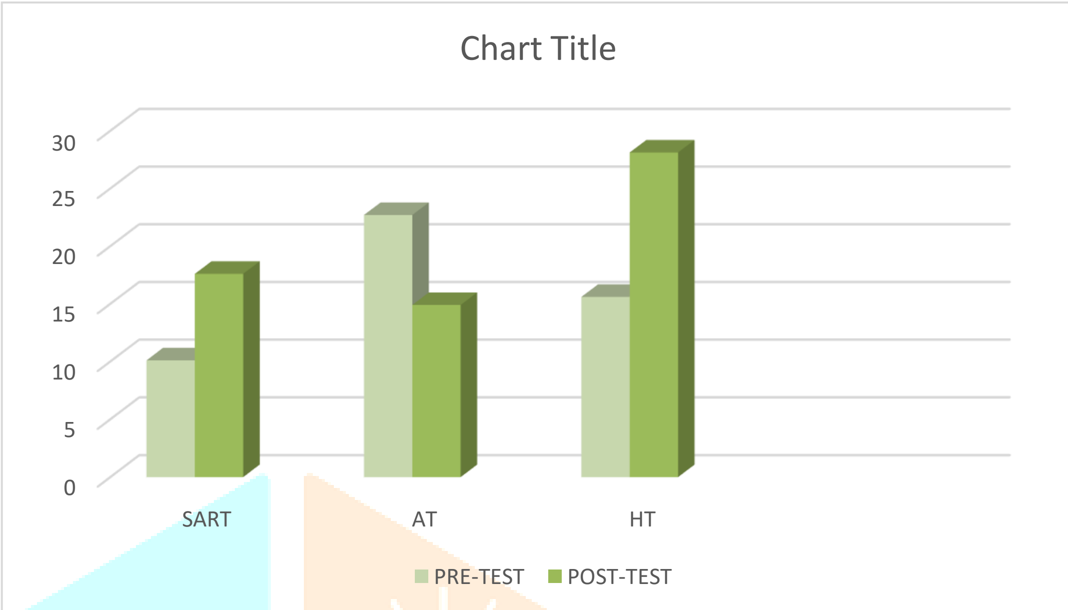


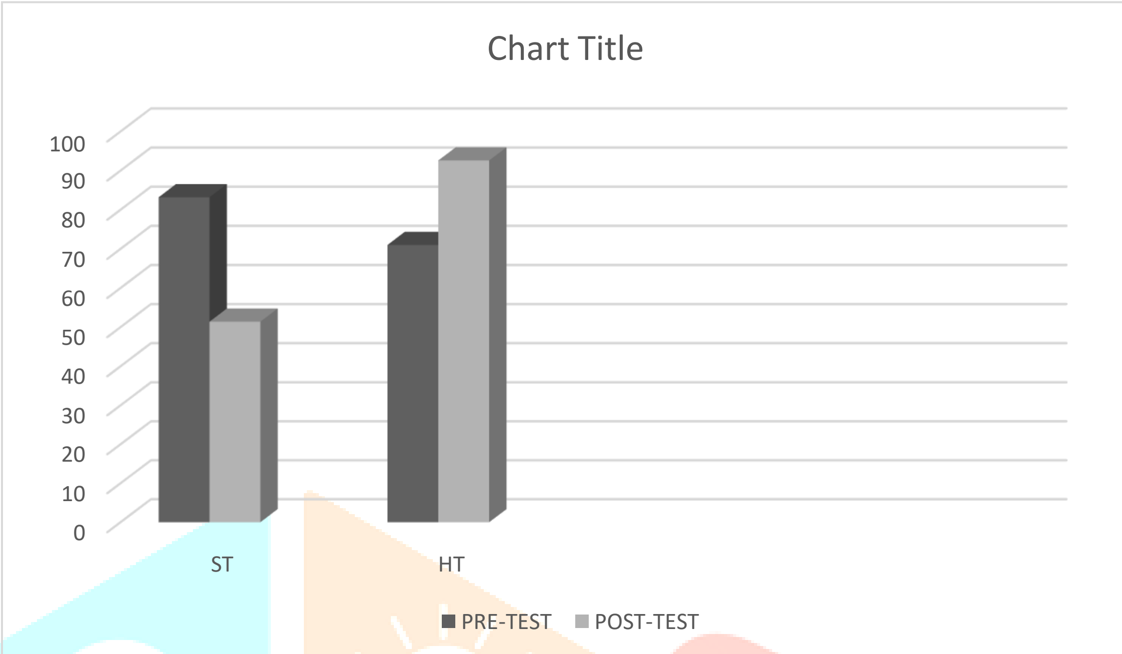
TABLE 2 REPRESENTS PRE AND POST VALUES OF EXPERIMENTALGROUP

TOOL	N	MEAN		SD		df	Stderr.df	T value
		pre	post	pre	post			
SART	10	10.10	17.6	1.91	3.27	9	0.65	11.46
AT	10	22.7	14.9	2.21	0.99	9	0.49	15.92
HG	10	15.6	28.12	1.45	2.25	9	0.34	37.16
ST	10	83.2	51.4	4.13	4.06	9	1.33	28.05
HT	10	71	92.6	5.54	2.99	9	2.06	10.45
VJ	10	1.97	2.43	0.28	0.32	9	0.03	17.25

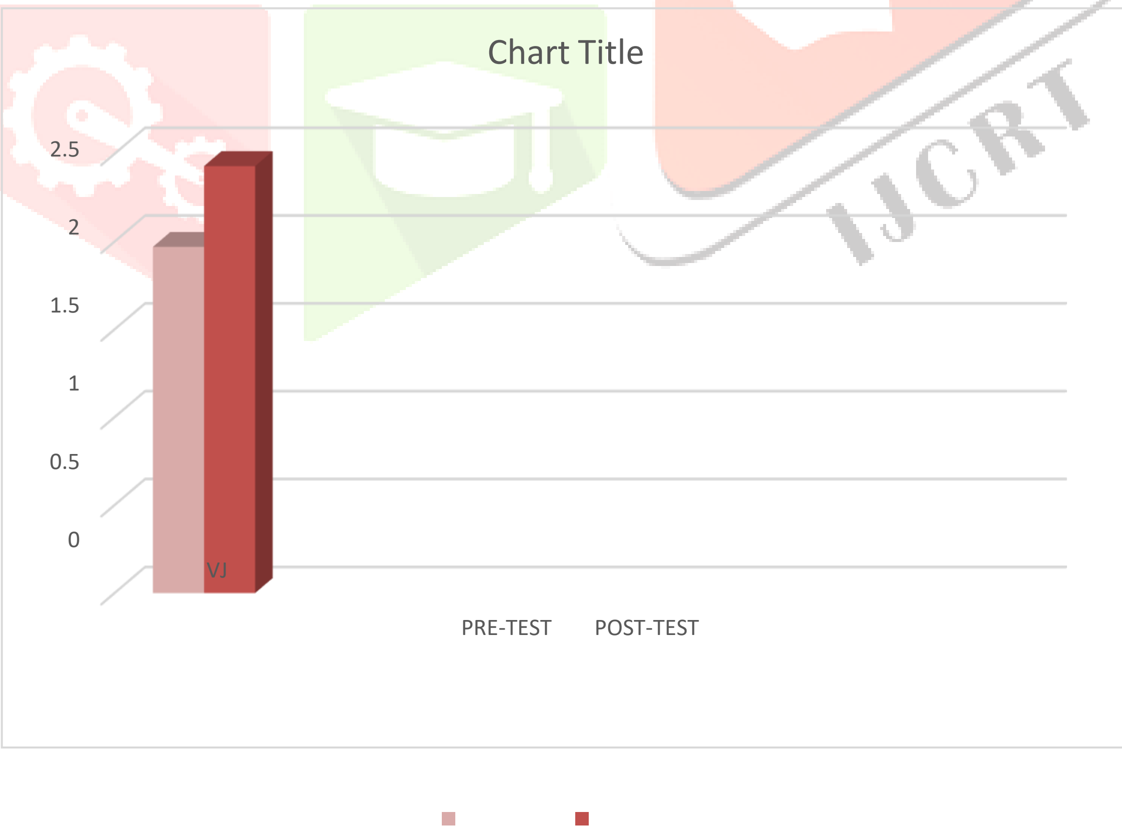
GRAPH 4 REPRESENTS PRE AND POST MEAN VALUES OF SART, AT, HT OF EXPERIMENTAL GROUP



GRAPH 5 REPRESENTS PRE AND POST MEAN VALUES OF STNAD HT OF EXPERIMENTAL GROUP



GRAPH 6 REPRESENTS PRE AND POST MEAN VALUES OF VJ OF EXPERIMENTALGROUP



RESULT

It was determined that there was no significant difference between the control group of tennis players who applied 8-week routine tennis training, when the pre-test and post-test values related to the significant difference was found when the pre-test and post-test values related to the experimental group tennis players who underwent 8-week functionaltennis training were compared ($p<0.0001$)

When the biomotor skills of the experimental and the control group of tennis players with 8-week functional and traditional routine tennis training and anaerobic power test measurements were compared, a significant difference was found in all variables in favour of the experimental group($p<0.01$) When comparing the pre-test–post-test values in terms of inter-group anaerobic capacity of the group, which applied the 8-week routine tennis and functional training program, a significant difference was found in favour of the experimental group

DISCUSSION

Scientific studies shows that functional training practices affect various physiological and biomotor features. Our study shows that there arestatistically significant differences between the control and experimental group of girl tennis players before and after the test. It has been suggested that functional training can be as effective as traditional resistance training to increase muscle strength and endurance. According to the findings of the research, because there was no significant difference between the differences in parameters related to biomotor skills (10m speed run, Vertical Jump, Flexibility, Hand Grip Force, and TTest)
In addition, the findings reveal that functional movement exercises related to tennis improve the biomotor skills of 14–18 year-old tennis players, when applied in parallel with routine tennis training. The literature review reveals few academic studies on functional training in children and child tennis players, and the effect of functional training when it is added to training programs in addition to tennis training has not been examined. At the same time, there are some studies on the development of biomotor characteristics in children and the relationships between them are revealed. However, it is possible to argue that there is a limited number of studies on "functional training" with regard to the development of athletic performance and biomotor skills in children.

This study found that there was no significant difference regarding biomotor skills between the pre-test and post-test values of the control group of tennis players, who had routine tennis training. There is the fact that, one-way practices are insufficient to develop biomotor skills. In our study, it was found that, when the pre-test and post-test values related to the biomotor skills of the control group of tennis players who were applied 8-week routine tennis training there was no significant difference regarding the anaerobic power test. However, when the pre-test and post-test values of the experimental group of tennis players with 8-week functional tennis training were compared, there was a significant difference regarding the anaerobic power test. In this study, a significant increase in the flexibility characteristics of only the functional training group was detected. The results of this study support the results demonstrating that functional training positive effects biomotor properties.

CONCLUSION

The findings reveal that functional training performed by imitating tennis, parallel to routine tennis training, improves the biomotor skills of 14–18 year-old tennis player girls. According to the research results, regarding the biomotor skills of the control and the experimental group of tennis players who performed the 8-week routine and functional tennis training (10-mspeed run, vertical leap, flexibility, Hand Gripping Force (kg)-right T"Test), comparing pre-test and post-test values within and between the groups, there was a significant increase in the experimental group that applied functional tennis training.

The present study concluded that, functional training is effective in improving biomotor skills in girl tennis players.

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