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RESEARCH ARTICLE

EFFECTS OF REGULAR TRAINING AND MINI TENNIS ACTIVITIES ON PHYSICAL AND PHYSIOLOGICAL PROFILES OF BOYS

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ABSTRACT

Aim: The purpose of this study is to examine the effects of 14-week training and tennis programme on physical and physiological profiles of boys aged 8 to 12 years.
Method: The experimental group consisted of 14 healthy boys. The average age, body mass index (BMI), height and weight are 9,9±1,2 years, 17,9±3,5 kg/m^2, 138,7±8,1cm and 34,4±10,3 kg respectively. Exercise sessions were carried out for 2 hours per week (Saturday and Sunday) over a 14-week period. Permission to conduct the study was obtained from parents, the medical committee and the Kafkas University Sarıkamış School of Physical Education and Sports. Some physical and physiological tests were measured. Hand grip strength, 20 m speed, balance, coordination, flexibility, anaerobic power, aerobic power, 30 s push-up, 30 s sit up, horizontal jump and pull-up tests were applied to subjects. The measurements were taken in resting condition before and after the 14-week exercise programme. Within the scope of the training programmes, there were 20 minutes of warm-up and gymnastics; 20 minutes of aerobic step to music to improve coordination and rhythmic skills; 20 minutes of educational games, including various types of sports (basketball, football, volleyball, handball); and finally, 60 minutes of basic tennis training. Each week, these activities were conducted in different ways to prevent them from becoming routine.Evaluation of the obtained data, SPSS for Windows 11.0 software with paired-samples t test was used for intra-group statistics. All measured parameters performed at the level of 0.01 and 0.05.
Findings: As a results of the analysis, there were significant differences between pre-post tests of all measured parameters at the end of the study.
Result: Consequently, 14 weeks regular training and mini tennis acivities has positive effect on physical and physiological developments of boys aged 8 to 12 years.

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INTRODUCTION

Nowadays, more sedentary lifestyle has been increasingly adopted due to technological advances. One of the groups mostly affected by this lifestyle is children. Action is very important for a child's physical development. Today, an action area of a child is extremely limited (Taşçı, 2010). According to Huizingha (1995), real chance of children for playing is decreasing day by day in today's conditions. This situation can be expressed as the home or school confinement of children and they are forced to be successful. The concept of play has originally fun and it should be reviewed like this, but today it has been commercialized and turned to a competition issue.

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The development advances as a whole in physical, mental, emotional and social areas. The development of the child in an area is associated with the development in other areas. For example, physical development is mostly associated with the child's movement development. The normal development of muscular system facilitates the movement development and then, movement development is also associated with social development. If a child can move comfort, the child can easily interact with people and it facilitates the social development; so social interaction accelerates the mental development (Bacanlı, 2011). If a healthy child is deprived of physical activity and sufficient movement possibilities, psychomotor development is blocked. In particular, children aged 11–15 years are concentrated in development, learning and comprehension and so, this group of children should be taught technical skills of sport branches.

"Practice (redoing) is important in skills training in the development of the upper level." (Gökmen *et al*., 1995) Otherwise, the acquisition of these skills will be quite difficult in future years. Sports do not make positive effect on only physical development of children at development age, but also effects all development. Children who play sports develop their personal experiences and creativity and gain a sense of responsibility. They learn solidarity, cooperation, friendship, respect to competitor and competition rules and they gain the sense of struggle without distributing the social cohesion. Here, sports have a very important and effective role on forming the basis of the condition in adulthood and education of virtuous individuals for the society. Except performance sports, regular sports has an important place for balanced and healthy growth in contemporary life. Regular sports activities with appropriate programs allow the healthy development of a child's physiques pre-and-post adolescence, and also delay the deterioration of the healthy physical structure (Ertat, 1984). The motor skills of girls and boys usually increase between the ages of 7 and 17 years (Kalkavan ve ark., 1996).

Today, increasing of sports activities for children and works herein indicates how sports have an important role in psycho-social development of people. Sports have an important place for children's both psychological and social care as well as playing. Because children act in groups participating in these activities at the same time, win or lose, they learn to obey the rules. One of the most important acquisitions they have is gaining self-confidence and justifying being a part of society. In this regard, sports programs for children development should be prepared in accordance with the upbringing of the children and it should give them a back for their social development. It should not be forgotten that the prerequisite for creating a healthy society is education of children and young people (Küçük ve Koç, 2010).

Purpose and importance: Children are unable to find an area for regular exercise due to physical conditions in Sarıkamış where this paper was carried out. Because of cold climate condition about eight months, children cannot participate in any sports activities, so they are far from any exercise and sports activities that they have an important role in children's development. When all these issues are taken into consideration, children should acquainted with regular exercise and teacher candidates should find specific exercise areas, so our study is considered so important in terms of fulfilling one of the most important basic missions of our academy. In this regard, this study reveals the impact of regular exercise and mini tennis exercises during 14-weeks on male students' both physical and physiological development.

MATERIALS AND METHODS

The working group was created by voluntary participation of 14 boys aged 8-12 years. The experimental group was created in accordance with permission by Kafkas University Sarıkamış School of Physical Education and Sports and the parents of children of the working group. The required permits were obtained and the banners which were prepared to reach the target audience were hanged on the schools and relevant places.

All candidates who wish to register were passed through a preliminary health screening and candidates without any health problems were included in the working group. The measurements were carried out twice; the first one was before starting to physical exercise practices and the second one was at the end of the 14th week after exercises were finished. Physical and physiological tests were applied as grip strength, 20 m speed, balance, coordination, flexibility, anaerobic power and aerobic, 30 second push-up test, 30 second sit up and pull-up horizontal jump tests. The study was planned in 2009-2010 academic year and was conducted between November and April. The exercises were for two hours-period on weekends (Saturday-Sunday). The exercises were included 20-minute warm-up and gymnastic exercises, 20-minute rhythm and musical aerobic stepper work to develop the hands and feet coordination, 20 minute-various sports (football, volleyball, handball, basketball...etc.) in the form of educational games and basic technical exercises and finally 60-minute mini-tennis exercises. The studies were applied in different forms in each week and routine exercises were avoided.

Tests performed in the study

Resting Heart Rate Measurement: Touching (palpation) method was used to determine resting heart rate. The pulse was checked on the carotid artery in the neck of the subjects during 20 seconds by countdown timer and the heartbeat was calculated after 20-seconds was multiplied by three times for one-minute heart rate.

Height and Body-Weight Measurements: The height of the subjects were measured with steel tape and sports clothes (shorts and shirts) and body-weights were measured by scale device with 10g Resolution (BASTER E-150) in an upright and looking across position.

Body Mass Index (BMI) is founded to determine the body composition and kilograms of body weight was found by dividing by the square of height in meters (Tamer, 2000).
BMI= Body weight (kg) / Height (m) ^{2}

V-Sit-Reach Flexibility Test: It was made to determine the flexibility of the lower back and hamstrings of the subjects. A straight line was marked 30 cm in length as the starting line. The measurement accuracy of 0.1 mm and a length of 60-80 cm lines will be placed perpendicular to the starting line and on both sides to be 30-40 cm. The intersection of the start line and measuring point was considered "0". It is asked to children that they should take off their shoes and sit; their heels should remain open V-shaped and 30 cm apart from each other. It was asked to subjects to put down their hands and their palms should be combined on the measurement line and their fingers tried to reach on measurement line, keeping them slowly as far as possible. The obtained scores are saved as plus (+) for reaching ahead of the start line or minus (-) for behind of start line, so achieved last point is recorded.

Flamingo Balance Test: Flamingo Balance test was used to determine the static equilibrium of the subjects. Subjects are tried to balance on a balancing beam covered with 50 cm to 3 cm in length and width of 4 in height with her dominant foot.

The subjects are bent the other leg at the knee to the hips and kept the hand on the same side of foot. Therefore, time is started and it is measured how many seconds s/he stays in balance per a minute. When the subject lost her balance, time is stopped. Then, the subject again steps up on balancing beam and time continues from where it left. The test continues in this way for a minute. When time expires, each balance attempt (after falling) is counted and this figure is recorded as point at the end of one minute.

Grip Strength Test: Hand grip strength was measured by Takei branded digital hand dynamometer. When subject was standing in an upright position, the dynamometer is calibrated according to the subject's hand size and the best value is recorded after two repetitions for each hand.

Horizontal Jump Tests: Horizontal jump tests were performed to determine the leg strength of the subjects. The starting point was determined with adhesive tapes on a flat surface. It is asked to subject to stand in the starting line with foot fingertips, their arms are sided and by simultaneously oscillating back and forth and requested to jump forward as far as possible. Jump distance is measured as ground between the starting line and the rear point of the ground which heels touch.

Vertical jump test results were calculated with Lewis Nomogram for measuring Anaerobic Power.

$P = (\sqrt{4.9} \times \text{body weight}) \times \sqrt{d}$,

D = vertical jump value in terms of m

Illinois Agility Test: It was performed to determine the subject's coordination and quickness. Test tract is established as width 5 m, length 10 m and three cones are lined up with 3.3 m intervals in the middle of test tract. Test includes 180º turns on every 10 m, 40 m flat of the tract is flat and 20 m of tract has slalom to pass through the slalom. After preparing the test system, two door of electronic timer with photocell (measuring accuracy of 0.01 sec) is established on start and finish lines. Finishing time is recorded as seconds. The test is repeated twice for participants and the best value is recorded.

Sit-Up Test (30 Seconds): It was carried out to determine abdominal strength and endurance. Subjects laid on flat with their knees bent at approximately right angles, with feet flat on the ground and their hands were resting on their thighs. It is asked to do sit-ups until they can repeat so much as they can for 30 seconds after "move out" command.

Table 1. Physical characteristics of the participants

Group		Age year	Height Cm		Weight Kg		BMI Kg/m^2		Resting Hearth Rate beat/min	
			Pre test	Post test	Pre test	Post test	Pre test	Post test	Pre test	Post test
Boys	X	9,92	137,86	138,75	33,48	34,47	17,52	17,94	88,30	82,30
n=14	S. D	1,26	8,27	8,18	10,50	10,03	3,67	3,54	4,06	3,54

Table 2. Average of subjects – The differences and significance levels between pre-test results and the standard deviation

n=14	Pre-test		Post-test		Differencess	t	p
Variables	X	±SD	X	±S.D.			
V-Sit and reach test (cm)	19,11	3,35	23,34	3,31	-4,23±2,00	-7,603	0,000*
Right Hand Grip Strength (kg)	16,33	3,62	17,75	3,51	-1,42±,80	-6,371	0,000*
Left Hand Grip Strength(kg)	15,49	3,58	16,54	3,18	-1,05±1,04	-3,652	0,003*
Vertical jump test (cm)	34,00	6,40	38,84	5,22	-4,84±3,21	-5,442	0,000*
Anaerobik power (kg.m/sec)	42,51	13,47	47,33	14,6	-4,82±2,82	-6,150	0,000*
Push up test (30 sec)	17,23	5,65	24,69	6,56	-7,46±5,05	-5,317	0,000*
Sit up test (30 sec)	15,69	4,73	24,15	2,99	-8,46±2,90	-10,504	0,000*
Flamingo Balance test	11,69	9,55	3,92	2,21	7,76±7,67	3,651	0,003*
Horizontal jump test (cm)	153,54	15,40	162,08	12,83	-8,53±3,75	-8,198	0,000*
Pull up test (sec)	22,84	14,85	56,38	29,25	-33,53±16,06	-7,529	0,000*
20 m speed test (sec)	4,91	0,57	4,40	0,41	0,50±0,35	5,226	0,000*
Agility test (sec)	23,88	3,85	21,05	1,60	2,83±2,57	3,972	0,002*
1 Mile Run-Walk test (min)	12,33	2,00	10,72	1,28	1,61±0,91	6,378	0,000*

* p< 0,05

Speed Test (20 Meters): It was conducted to determine the subject's sprint speed. New test 2000 photocell device was used for measurement. A convenient area for 20-meters speed test was found appropriate and it was asked to subject to complete this distance as quickly as possible.

Vertical Jump Tests: The determination of anaerobic capacity was determined by vertical jump values of subjects. Subjects were standing with his hands on their waists and then they quickly leaned and jumped to the top point they could jump.

Push Up Test (30 seconds): This test was conducted to determine the upper-extremity strength and endurance. The trial was showed to each subject and test was started after a trial and it is finished with "stop" command after 30 seconds. The press-up number that subject can repeat within 30 seconds duration is recorded as the performance level.

Flexed-Arm Hang Pull-Up Test: This test is carried out in a bar of 2.5 cm diameter with a size that subjects can hand without any jump. The values that subjects can hang until their eyes drop to the bar level were recorded as pull-up level of subjects.

1-mile Run/Walk Test: Aerobic capacity of subject was assessed with 1-mile (1609 m) run/walk test. It is required to complete this distance as soon as possible. Subjects were free to run, jog and walk to finish distance. Their finishing times were determined by using stopwatch and it was proceed as minutes and seconds.

Statistical Analysis: The statistical evaluation of obtained data was performed with SPSS for Windows 11.0. The mean and standard deviation values of measured parameters are found and the comparison of data before-and-after training plan was examined with paired-samples t test between the levels 0.05 and 0.01 levels.

RESULTS

In the study, 14 healthy male who has mean age 9.9 ± 1.2 years, mean height; 138.7 ± 8.1 cm, mean weight 34.4 ± 10.3 kg and mean body weight and body mass index 17.9 ± 3.5 kg /m2 voluntarily participated. According to evaluation, the values of height, weight, body mass index and resting heart rate of male subjects participated in the research before and after exercise program were given in Table 1. According to statistical evaluation, significant differences were found on male subjects through their all pre-and-post exercise parameters. (Table 2)

DISCUSSION AND CONCLUSION

The study was carried out to determine the effects of 14-weeks regular exercise and mini tennis exercises on boys' physical and physiological development and significant differences were found between pre-test and post-test values on all measured parameters. In various sports branches, there are many researches which are commonly applied on the effects of sports and training practices on children's physical development level, but there are limited researches about the effects of regular exercise and training on physical development of especially tennis and this age group. In a study which has same aim with our study, judo technical training and exercises on boys aged 8-10 years and the impact on their development levels were examined. In the study, 12-week play and judo techniques in accordance with their ages were applied for experimental group during two days for a week.

The control group did not participate in any exercise during that time. Pre-and-post training program, Eurofit tests were applied for all subjects. As a result, before and after workouts, a significant increase were observed on body weight, height, vertical jump, standing long jump, grip strength (right hand-left hand), sit-up and elasticity values ($p < 0.05$), but there was a decrease on flamingo balance test values. The study results show parallels with our study and it is revealed that judo training and exercises make positive impacts on physical development of children aged 8-10 years (Çakıroğlu *et al*, 2013). On the other hand, the study by Pekel *et al.* (2007) carried out performance-related physical fitness on children and grip (left) values was founded an average of 15.60 kg through athletes aged 10 years. However, this value is 16.54 in our study.

In our study, when pre-test and post-test values are compared, it could be said that the flexibility value of athletes are developed. The thesis study by Kara (2006) discussed 12-week training on physical fitness training and respiratory parameters and flexibility pre-test average was measured as 22.17 cm while post-test average was 24.03 cm. In another study, Saygın and Kuşgöz (2006) compared the physical activity and physical fitness of the primary school students in the different status and found flexibility average as 23.94 cm. Thanks to our study, flexibility parameter was developed and it is observed that the average was increased from 19.11 cm to 23.34 cm. In another study, the effect of folk dance in the physical developments of children, which are in need of protection and care, aged 9-12 years studying in different schools were observed. Folk dances were applied during three days (90 minutes per day) for 8 weeks and a significant difference related to their body fat percentage flexibilities of male experimental group was founded (Cerit *et al.,* 2012).

The sports activities which are held regularly in childhood play an important role for the development and maintenance of a healthy physical structure. Doing exercises regularly has an important place for a balanced and healthy development of a child. Every child should be in a certain physical activity to show healthy growth and development. While a sportive yield was expected by a child, her physiological, physical and psychological structures should be considered. The sporting activities for a child should be planned according to these features and multiple, creative and active exercises should be carried out instead of monotonous and repetitive static loadings (Açıkada, and Ergen, 1990).

The research was carried out boys between 7-12 years of age and the effects of 6-week basketball exercise on the body fat percentage were tried to analyze. There is no change between the boys who regularly played basketball, but it is observed that body fat percentage was increased in the control group 6-week basketball exercise (Hamamioğlu and Kaya, 208). In a study, 138 elementary school students between 7-10 years were participated and Body of Education course's effect on their motor skills was tried to analyze. It is observed that students who take Body of Education course for two hours were superior to others on acquisition and development of movement skills (Koç and Tekin, 2011). In another study which tried to reveal exercise's impact on motor and physical development and third grade students were discussed. Exercises were applied during 14 weeks, 2 hours per week. As a result, it was concluded that exercises developed basic and skills of children (Kuru and Köksalan, 2012). In another study conducted in childhood, boys who make exercises at least three hours for a week during a year and boys who do not make exercise were compared and it is stated that vertical jump values increased the level of physical activity (Ara *et al.,* 2004). The findings of our study support the studies above. Consequently, regular exercise and mini tennis exercises during 14-week period provide statistically significant improvements for physical and physiological profiles of boys between the ages of 8 and 12 years. It could be supported that regular exercise and mini tennis exercises during 14-week period have positive impacts on children's physical and psychological development.

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