INVESTIGATING THE EFFECTS OF COORDINATION TRAININGS ON
VELOCITY, BALANCE AND AGILITY FEATURES OF TENNIS KIDS ¹KOORDİNASYON ANTRENMANLARIN ÇOCUK TENİSÇİLERDE
SÜRAT DENGİ VE ÇEVİKLİK ÖZELLİKLERİNE ETKİSİNİN
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Öz: Bu çalışmanın amacı, koordinasyon antrenmanlarının çocuk tenisçilerde sürat, denge ve çeviklik özelliklerine etkisinin incelenmesidir. Araştırmaya Isparta ilinde bulunan 20 erkek tenisçi katıldı. Tenisçilerin yaş ortalaması 11,30±0,73 yıl, boy ortalaması 147,75±3,94 cm ve vücut ağırlığı ortalaması ön test 40,85±2,03 kg; son test 40,61±2,02 kg olarak hesaplandı. Araştırma grubunun tüm antrenmanları ve testleri Süleyman Demirel Üniversitesi Tenis Merkezi binasında yapıldı. Sporculardan antrenman periyodu öncesi ve sonrası Illinois Çeviklik Testi, Flamingo Denge Testi, Beş (5) ve On (10) Metre Sürat Testi ölçümleri alındı. Koordinasyon antrenmanları 8 hafta, haftada 3 gün, günde 90 dakika uygulandı. Elde edilen veriler SPSS 18.0 istatistik programında “Paired t Testi” kullanılarak karşılaştırıldı. Tenisçilere uygulanan tüm testlerin karşılaştırılması sonucunda istatistiksel olarak önemli derecede fark bulundu ($p<0,05$). Sonuç olarak, puberte dönemindeki erkek tenisçilerin koordinasyon antrenmanına bağlı olarak denge, sürat ve çeviklik özelliklerinde iyileşmeler olduğu görülmüştür. Buna paralel olarak tenisçilerin performansının olumlu yönde etkilendiğini söyleyebiliriz.

Anahtar Kelimeler: Tenis, Koordinasyon, Çocuk

Abstract: The aim of this study was to investigate the effects of coordination trainings on velocity, balance and agility features of tennis kids. 20 male kids living in Isparta participated in the study. The mean age of tennis players was 11,30±0,73 year, the mean height was 147,75±3,94 cm and the mean weight was calculated in pre-test 40,85±2,03 kg; in post-test 40,61±2,02 kg. All trainings and tests of research group were applied at Süleyman Demirel University Tennis Center. Measurements of Illinois Agility Test, Flamingo Balance Test, Five (5) and Ten (10) Meters Velocity Tests were taken before and after coordination trainings. Coordination trainings were applied for 8 weeks, 3 days a week, 90 minutes a day. Handled datas were compared by using “Paired t Test” by SPSS 18.0 statistic programme. As a result of comparing all the tests applied to the players, the differences were found to be statistically significant ($p<0,05$). To conclude, we can say that positive improvements have been seen in balance, velocity and agility depending on coordination trainings of male tennis players at puberty. In parallel, we can say that performances of tennis players were affected positively.

Key Words: Tennis, Coordination, Kid

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INTRODUCTION

Tennis, which is an individual branch of sport, is of great significance because it is the sort of game which requires the players to do effective strokes, to meet the ball at the most suitable posture and by extension require them to adjust themselves to varied movements and help them to improve their motor skills.

Coordination is an important factor which determines the technique. Coordination exercises provide movements to be quick, high-efficiency, safe, aesthetic and relevant (Komi, 1992: 249-250.). An athlete with good coordination can perform more effectively for longer periods. He can perform better and longer because he is less likely to suffer from muscle weakness while performing the movements (Whiting and Vereijken, 1993: 343-357; Ringenbach and Amazeen, 2005: 1-18). Teenagers are more likely to develop good coordination compared to adults. Because the adaptability of the neural system to the changing environment is much better at early ages (Ölçücü, 2010: 1-11). Tennis players try to develop this skill in order to do effective shots during trainings and games. Playing tennis requires fast swings, quick arm movements, jumps and moves (Gullikson, 2003: 135-156). While performing techniques in tennis, arm, torso and leg muscles must be stretched in coordination with each other by means of which one can control the

movements done with more than one junction (multi-junction movement). A tennis player is supposed to perform moves in every possible direction. If a player does not take the proper position during the game, he is less likely to conduct a good stroke. In such a case, speed is extremely important to be able to catch the ball (Bompa, 1998: 47-65).

Balance in addition to agility, which is one of the basic requirements of tennis, is also of great significance (Kejonen, 2002: 78-81). The applicability of the movements done in daily life and in exercises is in direct proportion with the proper balance being established and agility being improved. Having the proper balance is claimed to raise performance in exercises. It is also pointed out that the movements essential for better performance in sports are a prerequisite for sports (Zenbilci, 1995: 194-197).

In the light of the knowledge obtained from the literature, this study seeks to examine the effects of coordination exercises on speed, balance and agility among children.

MATERIALS and METHODS

20 male tennis players took part in the study. The average age of the children (n=20) who took part in the study was found to be $11,30 \pm 0,73$ years while the average height was determined $147,75 \pm 3,94$ cm. Parents' consent was taken. All the training and tests

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of the subjects were conducted in Tennis Center at Süleyman Demirel University between 16:00 and 18:00.

Measurement of height: Measurements were conducted with the subjects standing upright barefoot, in deep inspiration. A measuring steel scale was placed against the head and the span between the sole and the top of the head was measured with a margin error of 0,5 cm.

Measurement of weight: Measurements were done with an electronic scale (SECA) with 0,5 kg fallibility. The subjects were weighed barefoot in shorts and t-shirts.

Illinois Agility Test: The athlete lies face-down with his head at the start line. Then he runs for the first 10 meters on the start command; he runs 10 meters again having turned around the cone and after that the athlete weaves in and out of the row of cones. Having performed a slalom of 10 meters, he returns and repeats this slalom and arrives at the starting point of the slalom. After that point, he runs 10 meters and turns around the cone and finishes the last 10 meters and arrives at the finish line, where the test is complete.

Flamingo Balance Test: A wooden beam with a length of 50 cm, a height of 4 cm and width of 3 cm was used for this test. The athletes stand on the beam barefoot with one foot on the beam like a flamingo. While

standing on one leg, the other is flexed at the knee, with the foot close to the buttocks, the stopwatch is started. The watch was stopped when the person lost his balance. Timing was started again and kept until the person lost balance again. Balance losses in 60 seconds were counted.

Five (5) and Ten (10) Meter Sprint Test: In a standard tennis court, after a 15 minute warmup, the athletes ran a 5 meter and a 10 meter course back and forth on the start command given for the each single athlete. The total time taken between the start and the finish was found. The test was applied to the athletes three times and the best performances were recorded.

The Training Program: Coordination trainings were given to the participants for 90 minutes a day and 3 days a week for a period of 8 weeks. In the training, after a 15-minute warm up, the athletes were given coordination training for 60 minutes and in the final 15 minutes they performed a stretching and cooling down exercise. In the training, the athletes did rope skipping, foot exercises with cones and plates, jumping over hurdles, slalom exercises, agility ladder exercises, cone drills, drills on court lines, balls to bounce and dribbling with a racket and knee bending drills.

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Data Analysis: SPSS 18.0 program was used in this study to obtain statistical results. In order to determine whether there was a difference between pre-training and post-training,

an in-group paired test was applied. The level of significance was evaluated according to “0,05” importance level.

FINDINGS

Table 1. Descriptive Statistics Related to Athletes' Physical Values

	N	Minimum	Maximum	Mean±SS
Age (year)	20	10,00	12,00	11,30±0,73
Height (cm)		140,00	150,00	147,75±3,94

Table 2. Comparison of Athletes' Weight Pre and Post Test Values

Weight (kg)	Test Sequence	Mean±SS	t	p
	Pre Test	40,85±2,03	4,81	,000*
	Post Test	40,61±2,02		

***p<0,05**

Upon analyzing the Table 2,a significant difference was found statistically in pre and post t test values of research group (p<0,05).

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Table 3. Comparison of Athletes' Agility Pre and Post Test Values

Illionis Agility Test (sec)	Test Sequence	Mean±SS	t	p
	Pre Test	19,62±1,01	3,78	,010*
	Post Test	19,53±0,98		

***p<0,05**

cally significant between pre and post values (p<0,05).

According to the agility test parameters in Table 3, a difference was found to be statisti-

Table 4. Comparison of Athletes' Balance Pre and Post Test Values

Flamingo Balance Test (piece)	Test Sequence	Mean±SS	t	p
	Pre Test	16,30±2,75	9,73	,000*
	Post Test	14,15±2,85		

***p<0,05**

As shown in Table 4, a significant difference was found between pre and post values of Flamingo Balance test (p<0,05).

Table 5. Comparison of Athletes' Velocity Pre and Post Test Values

Velocity Test	Test Sequence	Mean±SS	t	p
5 m (sec)	Pre Test	1,29±0,04	11,26	,000*
	Post Test	1,27±0,04		
10 m (sec)	Pre Test	2,41±0,04	7,85	,000*
	Post Test	2,39±0,04		

***p<0,05**

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As seen in Table 2, significant differences were found statistically in pre and post t test values of 5 and 10 m velocity tests ($p<0,05$).

DISCUSSION

This study seeks to examine the effects of coordination drills on speed, balance and agility among children. 20 male tennis players from Isparta took part in the study. The average age of the children ($n=20$) who took part in the study was found to be $11,30\pm0,73$ years while the average height was determined to be $147,75\pm3,94$ cm. The Pre-test average weight was found to be $40,61\pm2,02$ kg while the posttest average weight was found to be $40,85\pm2,03$ kg. A statistically significant difference was found between the body weight measurement values ($p<0,05$).

In modern tennis, players should be able to take the proper position against the ball in the fastest possible time so that they can do effective strokes; therefore, agility is of great significance for a better performance in tennis.

In the study conducted in the light of the obtained data, while the pre training agility measurement value was $19,62\pm1,01$ sec, the post training measurement was $19,53\pm0,98$ sec. A significant difference was determined between the pre training and post training agility values ($p<0,05$).

Fresno et al. (2010) studied the change in the body composition and physical fitness in elite tennis players over the season. The average of agility of the seven elite players in the first month was found to be 11.42 ± 0.66 sec while it was found 11.05 ± 0.59 sec at the end of the 10th month.

Ölçücü et al. determined the following agility measurement values in 2010, in the study in which they dealt with the factors contributing to the development of talent of tennis among children between 10-14 years. For the first group, while the value was $17,90\pm0,74$ sec at the beginning, it was determined as $13,54\pm0,68$ sec after 3 weeks and $14,51\pm0,45$ sec after 6 weeks. For the second group, while it was $15,31\pm0,82$ sec, it was found to be $14,66\pm0,85$ sec after 3 weeks and $14,46\pm0,45$ sec after 6 weeks. In the second measurements, a significant difference in the agility parameter was determined to be in favor of the first group ($p<0,05$).

In their study in which they studied the effects of balance and flexibility on agility in the pre-pubescent period, Hazar and Taşmektepligil (2008) found the value of $22,38\pm1,58$ sec in the Illinois Agility test they performed.

In 2012, Akdeniz et al, in their study in which they dealt with the effects of muscle injury generating from exercise on speed and agility, found the following measurement values

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in the Illinois agility tests they conducted: The baseline $16,78 \pm 1,56$ sec, 1 hour later $18,50 \pm 1,83$ sec, 24 hours later $19,68 \pm 1,63$ sec, 48 hours later $19,13 \pm 1,18$ sec, 72 hours later $17,74 \pm 1,42$ sec, 96 hours later $17,34 \pm 1,70$ sec. They found significant differences between the pretest and posttest measurement scores ($p < 0,05$).

In 2010, Kızılet et al in their study in which they discussed the effects of different strength training on the speed and jump ability of basketball players between 12-14 years old, found that for group A Illinois agility pretest value was $18,65 \pm 1,03$ sec while the posttest value was $17,97 \pm 1,01$ sec; for group B Illinois agility pretest value was $18,34 \pm 1,15$ sec while it was found to be $17,95 \pm 0,92$ sec for the posttest. They found a statistically significant difference between the respective pretest and posttest measurement values of the two groups ($p < 0,05$).

In the light of the data obtained from the literature, although some improvements were observed in the agility performance of the athletes thanks to the training given, this was an average increase according to Illinois test values and we are of the opinion that the agility can be improved further over longer periods.

It is pointed out that balance exercises improves performance and that they are im-

portant to the dynamic sports which involve movements done with high speed and to the preservation of body composition necessary for high performance in sports. (Altınkök and Ölçücü, 2012: 273-276). It is an essential ability to keep the body balance during sudden swings, the right position during and after the stroke in a game of tennis.

When we studied the Flamingo balance test average test scores, we saw that it was $16,30 \pm 2,75$ piece for pretraining and $14,15 \pm 2,85$ piece for post training. The results suggest that the coordination drills significantly improved the balance ability of the athletes ($p < 0,05$).

Karagöz et al studied in 2015 some physical and physiological parameters of a group of junior tennis players and did research on the relation between these parameters and fore-hand-backhand stroke performances. They found an average score of $11,25 \pm 53$ piece in the flamingo balance test.

In 2007, Erkmen et al in a study in which they compared the balance performances of athletes from different sport branches determined the footballers' dominant leg stability balance scores as 17,15 piece.

Mohamed et al (2009) compared the anthropometric and performance values of the handballers to the reference group in order to determine the ability model for handballers

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and they found an average score of 12.1 ± 4.6 piece for the handballers and an average score of 16.7 piece for the reference group in the Flamingo balance test.

The data obtained in our research bear resemblance to the data obtained in some studies in the literature; however, data in other studies do not bear resemblance to ours.

Speed is an explosive type of movement essential to the performance in many sports branches. Speed is of great significance in tennis because it enables players to catch the ball in the shortest time possible.

The pretest average scores of the athletes in 5 meter speed test was 1.29 ± 0.04 sec and for the posttest was 1.27 ± 0.04 sec; while the pretest average score was 2.41 ± 0.04 sec in 10 meter speed test, the posttest average was found to be 2.39 ± 0.04 sec. For the training group, in the 5 and 10 meter speed test parameters a statistically significant difference was found between the pretest and posttest measurement values ($p < 0.05$).

In 2005 in a study by Hazar to determine the effect of agility on good performance, the pretest 10 meter speed scores were found to be 2.53 ± 0.1 sec and the posttest 10 meter speed scores were found to be 2.38 ± 0.1 sec. For the 10 meter speed variable, a statistically significant difference was found between the pretest and posttest scores ($p < 0.05$). The re-

spective 10 meter speed scores in our study and in Hazar's are close.

Okur (2011) in a study in which he worked on the effects of a speed training program on acceleration and agility in basketball, conducted an eight week speed training program for junior basketball players. For the study group, the respective pretest and posttest scores in the 5 meter speed test were 1.17 ± 0.08 and 1.10 ± 0.05 sec and for the 10 meter speed test the respective scores were 1.97 ± 0.09 and 1.88 ± 0.08 sec. For the control group, in the 5 meter speed test, the respective pretest and posttest scores were 1.17 ± 0.06 and 1.14 ± 0.03 sec; for the 10 meter speed test, the respective scores were 1.98 ± 0.10 and 1.95 ± 0.08 sec. A statistically significant difference was determined between the 5-10 meter speed test posttest scores of the study and control group ($p < 0.05$).

We suppose that the fact that the speed scores in Okur's study in 2011 are better than those in ours may be due to the age gap between the athletes in that study and in ours.

Aktaş et al in a study in 2011 worked on the effects of a strength training on the motor skills of a group of male tennis players between 12-14 years old. They found that for the experimental group the respective pretest and posttest scores for the 5 meter speed test were 1.05 ± 0.03 and 0.99 ± 0.06 sec; for the 10

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meter speed test, the respective scores were $1,86 \pm 0,07$ and $1,80 \pm 0,07$ sec. The speed test scores in Aktaş et al's study are lower compared to those in ours, which may generate from different training programs.

RESULTS

To conclude, it was observed that 8-week coordination training programs improved balance, agility and speed in 10-12 years old male tennis players. In the light of these, we can conclude that as a result of the coordination training of male tennis players in adolescence period, the improvement in balance, speed and agility positively contributed to the performance. Furthermore, we are in the opinion that tennis training periods may be longer and as a result, the progress made may be analyzed in detail thanks to the better data to be obtained. Also, better and more useful data may be obtained from studies done on groups with more athletes.

The coordinative ability of the players in tennis is supposed be in the upper levels. Within this context, we think that if the coordinative and fitness qualities of athletes are trained simultaneously, they can perform better.

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