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Comparing 9 to 10 years old children's performance in tennis and physical fitness activities

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The aim of the study is to determine the degree of performance- related physical coordination of elementary education children (male and female) that play tennis according to their age and gender and to investigate the relationship between their motor ability tests and performances. A total of 210 children tennis players (9 to 10 years; 105 males and 105 females) who have the Turkish Tennis Federation club licence and individual licence were included in the study. The height, body weight of the subjects were measured to determine their performance- related physical coordination. Tests of ball throwing, 10 m sprint, two-feet jumping, range, static balance and vertical jumping were performed. Pearson correlation test was used to determine the relationship between the motor tests used in detection of performance related physical coordination. According to statistical results, there was a significantly negative difference between the parameters of ball-throwing-10 m sprint and 10 m sprint-two feet jumping (p=0.001), a significantly negative difference between the parameters of 10 m sprint-vertical jumping, two feet jumping-static balance and range test-static balance (p=0.05), a significantly positive difference between the parameters of ball-throwing- two feet jumping and vertical jumping-static balance (p=0.001) and a significantly positive difference between the parameters of range test-vertical jumping (p=0,01), a significantly positive difference between the parameters of ball throwing-vertical jumping, ball throwing-range test and 10 m sprint-range test (p=0,05). There was no significant difference between the parameters of ball throwing-static balance, 10 m sprint-static balance, two feet jumping-range test and two feet jumping-vertical jumping. As a result, the relationship of motor ability test parameters in female and male children tennis player in the age group of 9 to 10 was demonstrated. It can be suggested that the tennis performance of the children could be estimated in this age group by the significance of the relationship between their motor ability tests.

Key words: Tennis, physical fitness, motor ability tests, Pearson Correlation, elementary age.

INTRODUCTION

Physical fitness is related to both the elements of health and ability. Health related physical fitness components are cardiovascular endurance, muscular strength, body composition and flexibility. Performance related physical fitness components are the health related elements and agility, strength, speed and balance components (ACSM, 2000; Bouchard and Shephard, 1994; Freedson et al., 2000; Gutin et al., 1992; Güler, 2003; Looney and Plowman, 1990; Özer, 2001; Pate, 1983; Tekelioğlu, 1999). Tennis challenges technical, tactical and psychological abilities of a player. Tennis is considered one of the best sport branches that enhance physical, mental, emotional and social development abilities when applied within a regular schedule (Haşıl and Ataç, 1998). Strength, stamina, speed, mobility, skill and coordination are required for performance (Kermen, 1997).

Tennis game requires high levels of physical strength. Since physical fitness, flexibility, heart-circulatory endurance, general strength and muscle endurance comprise the basic properties of this branch. Movement training

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Table 1. Statistic test results of age, height and body weight according to gender properties.

Variables	Age	n	Boys	Girls
Height (cm)	9	105	139 ± 1.12	138.5 ± 1.42
	10	105	143.5 ± 1.41	145 ± 2.64
Body Weight (kg)	9	105	32.7 ± 5.12	33.9 ± 6.41
	10	105	36.8 ± 6.21	37.7 ± 7.01

program at early age groups provides physical development. After establishing a sound physical fitness, athletes of young age groups should move to basic and special exercises to prevent injury. Athletes in this level may use the majority of their exercise time for athletic physical fitness and tennis special technique workouts later on. As known, anaerobic capacity is primary in tennis; and coordination, agility, balance, speed and strength are the most important body components (Crespo and Miley, 1998). Coordination, agility and speed must be developed at early age (Sevim, 1995).

The purposes of this study are to determine the physical fitness levels of elementary tennis players with regard to their age groups and gender and to demonstrate the relationships between their motor ability and test performances.

MATERIALS AND METHOD

A total of 210 children tennis players (9 to 10 years; 105 males and 105 females) who have the Turkish Tennis Federation club licence and individual licence were included in the study. Necessary measurements were conducted prior to the exercises with the consultancy of the trainers.

Data collection and measurements

Children involved in the research were informed of the measurements in detail. Measurements were made in Ankara Tennis Club courts. Tennis Ball Throwing, Ten Meters Sprint, Two-feet jumping, Vertical Jumping were used for motor ability tests (New test 2000). Static Balance Flamingo Balance Test and Range (Agility) Tests have been performed.

Data analysis

Pearson correlation test was performed to identify the relationship between motor tests that are used for the detection of performance related physical suitability. One way ANOVA statistic method was used to identify the arithmetic mean and standard deviations in the gender based motor ability tests.

Based on their age and to determine their physical properties such as height and weight, arithmetic mean and standard deviations were taken. One way ANOVA test was performed to determine the significance of motor ability tests depending on the gender differences. Pearson correlation test was used to find the relationship between the motor tests used to determine performance-related physical coordination.

FINDINGS

One way ANOVA statistics test result was used to determine the arithmetic mean and standard deviation of age, height, weight and motor ability tests according to gender properties.

As seen in Table 1, arithmetic mean of height and physical properties based on age of the study group has similar values.

The physical characteristics of female and male tennis players in the same age groups have close values.

As seen in Table 2, in two-feet jumping, ball throwing and ten meters sprint results of one way ANOVA test based on their motor ability, a significance of 0.001 level in favour of boys was found while there is no significance whatsoever in Range, Vertical Jumping and Static Balance test values.

Boys performed better than the girls in ball throwing, two-feet jumping, ten meters sprint and vertical jumping performance tests, while girls performed better in range and static balance tests (Table 2).

Pearson Correlation test result was used for identifying the relationship between motor tests used in detecting physical fitness.

As seen in Table 3, ball throwing and ten meters sprint according to motor ability levels in Pearson Correlation have a significant negative difference of 0.001 ($p<0.001$).

As seen in Table 4, ball throwing and two-feet jumping according to motor ability levels in Pearson Correlation have a significant positive difference of 0.001 ($p<0.001$).

As seen in Table 5, ball throwing and range test according to motor ability levels in Pearson Correlation have a significant positive difference of 0.05 ($p<0.05$).

As seen in Table 6, ball throwing and static balance according to motor ability levels in Pearson Correlation have no significant difference ($p>0.05$).

As seen in Table 7, ball throwing and vertical jumping according to motor ability levels in Pearson Correlation have a significant positive difference of 0.05 ($p<0.05$).

As seen in Table 8, ten meters sprint and two-feet jumping according to motor ability levels in Pearson Correlation have a significant negative difference of 0.001 ($p<0.001$).

As seen in Table 9, ten meters sprint and range test according to motor ability levels in Pearson Correlation have a significant positive difference of 0.05 ($p<0.05$).

As seen in Table 10, ten meters sprint and vertical jumping according to motor ability levels in Pearson Correlation have a significant negative difference of 0.05 ($p<0.05$).

As seen in Table 11, ten meters sprint and static balance according to motor ability levels in Pearson Correlation have no significant difference ($p>0.05$).

As seen in Table 12, two-feet jumping and range test according to motor ability levels in Pearson Correlation

Table 2. One way ANOVA test results to determine the arithmetic mean and standard deviation of ball throwing, two-feet jump, range test. vertical jumping, ten meters sprint and static balance tests based on gender.

Test	Gender	Subject count	Average ± SS	p
Ball throwing	Boy	105	24.28 ± 3.68	.000
	Girl	105	19.71 ± 4.82	P<0.001
Two-feet jumping	Boy	105	1.59 ± 0.13	.000
	Girl	105	1.46 ± 0.18	P<0.001
Range test	Boy	105	13.79 ± 10.28	.342
	Girl	105	12.81 ± 2.54	P>0.05
Vertical jumping	Boy	105	21.83 ± 5.33	.707
	Girl	105	21.56 ± 5.30	P>0.05
Ten meters sprint	Boy	105	2.07 ± 0.08	.000
	Girl	105	2.17 ± 0.24	P<0.001
Static balance	Boy	105	33.27 ± 16.37	.558
	Girl	105	34.59 ± 16.04	P>0.05

Table 3. Pearson correlation test results used in identifying whether there is any differentiation or not between ball throwing and ten meters sprint test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ball throwing	210	22.00 ± 4.85	-0.348	0.000
Ten meters sprint	210	2.12 ± .19		P<0.001

Table 4. Pearson Correlation test results used in identifying whether there is any differentiation or not between ball throwing and two-feet jumping test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ball throwing	210	22.00 ± 4.85	0.269	0.000
Two-feet jump	210	1.52 ± .17		P<0.001

Table 5. Pearson correlation test results used in identifying whether there is any differentiation or not between ball throwing and range test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	P
Ball throwing	210	22.00 ± 4.85	0.198	0.049
Range test	210	13.30 ± 7.49		P<0.05

have no significant difference (p>0.05).

As seen in Table 13, two-feet jumping and vertical jumping according to motor ability levels in Pearson Correlation have no significant difference (p>0.05).

As seen in Table 14, two-feet jumping and static balance according to motor ability levels in Pearson Correlation have a significant negative difference of 0.05 (p<0.05).

As seen in Table 15, range test and vertical jump according to motor ability levels in Pearson Correlation

Table 6. Pearson correlation test results used in identifying whether there is any differentiation or not between ball throwing and static balance relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ball throwing	210	22.00 ± 4.85	0.083	0.230
Static balance	210	33.93 ± 16.184		P>0.05

Table 7. Pearson correlation test results used in identifying whether there is any differentiation or not between ball throwing and vertical jumping relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ball throwing	210	22.00 ± 4.85	.233	0.34
Vertical jump	210	21.70 ± 5.30		P<0.05

Table 8. Pearson correlation test results used in identifying whether there is any differentiation or not between ball throwing and two-feet jumping test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ten meters sprint	210	2.12 ± .19	-0.352	0.000
Two-feet jump	210	1.52 ± .17		P<0.001

Table 9. Pearson correlation test results used in identifying whether there is any differentiation or not between ten meters sprint and range test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ten meters sprint	210	2.12 ± .19	0.218	0.040
Range test	210	13.30 ± 7.49		P<0.05

Table 10. Pearson correlation test results used in identifying whether there is any differentiation or not between ten meters sprint and vertical jumping test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ten meters sprint	210	2.12 ± .19	-0.193	0.46
Vertical jump	210	21.70 ± 5.30		P<0.05

have a significant difference of 0.01 (p<0.01).

As seen in Table 16, range test and static balance according to motor ability levels in Pearson Correlation have a significant difference of 0.05 (p<0.05).

As seen in Table 17, vertical jump and static balance according to motor ability levels in Pearson Correlation have a significant difference of 0.001 (p<0.001).

DISCUSSION

Physical and physiological tests performed on children are used to determine the effects of regular physical activity on growth, development and health and to investigate the trainability of adolescent children. Long term tendencies of children in growth, development and physical suitability models and their acute responses to exercises in different levels are also identified with these tests (Docherty, 1996).

The relationship between motor skill performances of 9 to 10 years old tennis players in two-feet jumping, ball throwing, ten meters sprint, range, vertical jumping and static balance tests was investigated.

Arithmetic averages of height and body weight physical

Table 11. Pearson correlation test results used in identifying whether there is any differentiation or not between ten meters sprint and static balance relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Ten meters sprint	210	2.12 ± .19	-0.028	0.683
Static balance	210	33.93 ± 16.184		p>0.05

Table 12. Pearson correlation test results used in identifying whether there is any differentiation or not between two-feet jumping and range test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	p
Two-feet jump	210	1.52 ± .17	0.011	0.879
Range test	210	14.50 ± 1.84		P>0.05

Table 13. Pearson correlation test results used in identifying whether there is any differentiation or not between two-feet jumping and vertical jumping relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	P
Two-feet jump	210	1.52 ± .17	-0.093	0.178
Vertical jump	210	21.70 ± 5.30		p>0.05

Table 14. Pearson correlation test results used in identifying whether there is any differentiation or not between two-feet jumping and static balance test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	P
Two-feet jump	210	1.52 ± .17	-0.175	0.43
Static balance	210	33.93 ± 16.184		P<0.05

Table 15. Pearson correlation test results used in identifying whether there is any differentiation or not between range test and vertical jumping test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	P
Range test	210	13.30 ± 7.49	0.334	0. 009
Vertical jump	210	21.70 ± 5.30		P<0.01

attributes of the study group have similar values. Mülazımoğlu (2007) investigated the skill levels of children whose somatotype composition suitable for sports showed similarities with the height and body weight averages of male and female students of the current study.

Different levels of significance were detected in tests performed to identify performance related physical suitability which are Ball Throwing – Ten Meters, Ball Throwing – Two-feet jump, Ten Meters – Two-feet jump, Vertical Jump – Static Balance, Range – Vertical Jump, Ball Throwing – Range Test, Ball Throwing – Vertical Jump, Ten Meters – Range Test, Ten Meters – Vertical Jump, Two-feet jump – Static Balance and Range – Static Balance Test parameters.

The relationship between Ball Throwing and Static Balance, Ten Meters and Static Balance, Two-feet jumping and Range, Two-feet jumping and Vertical Jumping test parameters was not statistically important.

Similar studies investigating the relevance between motor ability tests performance of 9 to 10 year old tennis players have not been encountered in the literature.

Table 16. Pearson correlation test results used in identifying whether there is any differentiation or not between range test and static balance test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	P
Range test	210	13.30 ± 7.49	-0.256	0. 18
Static balance	210	33.93 ± 16.184		P<0.05

Table 17. Pearson correlation test results used in identifying whether there is any differentiation or not between vertical jump and static balance test relation in the study group.

Test	Subject count	Average ± SS	Pearson Correlation	P
Vertical jump	210	21.70 ± 5.30	0.408	0. 000
Static balance	210	33.93 ± 16.184		P<0.001

In two-feet jump, ball throwing and ten meter sprint test, there was significant difference in favor of boys based on their motor ability levels; while no significant difference whatsoever was found in range, vertical jump and static balance test values.

Vertical jumping averages were 21.83±5.33 in male tennis players and 21.56±5.30 in female tennis players (Table 2). Jumping tests are used to measure explosive power attribute and we use jump height for that. Muscular strength significantly increases with age and the most remarkable development occurs in adolescent children and teenagers (Muratlı, 1997). Ziyagil et al. (1999) reported the vertical jumping averages of 10 year old boy students as 27.54±0.47. Gül et al. (2006) have found the vertical jump averages of 10 to 12 year-old boy students as 27.77±5.12 for experimental group and 31.87±6.84 for the control group. The results of previous studies do not show any similarity with our findings. Comparisons were made based on gender factor and the relationship was significant in favor of boys for vertical jumping.

Two-feet jump averages were 1.59±0.13 in male tennis players, while 1.46±0.18 in girls (Table 2). Standing long jump is an anaerobic test based on explosive power just as in vertical jumping. Gül et al. (2006) have found the standing long jump averages of 10 to 12 year-old boy students as 140.96±17.97 for experimental group and 130.58±15.69 for the control group. Arslan et al. (2007) have found standing long jump averages for boy students as 1.82±0.21 cm. Arabacı et al. (2008) have found the standing long jump averages of 9 to 10 year-old boy students as 1.38±0.23. The research results and our findings do not show any similarities. Akşit and Özkol (2006) have found the standing long jump averages of 10 year-old boy tennis players as 1.54±0.13 which was similar to our finding. In our research, comparisons were made based on gender factor and significance in favor of boys in standing long jump was found.

Static balance averages were found to be 33.27±16.37 in male tennis players and 34.59±16.04 in female tennis players (Table 2). Jastrejevskaya says that balance is a factor for distinguishing good and bad performers in terms of sportive abilities and it contributes to body development for demonstrating motor skills (Altay, 2001). Erkmen et al. (2007) have compared the balance performances of athletes in different sport branches, and as a result in terms of balance, best performance is shown by gymnastics athletes, followed by footballers and basketball players. Er (1995) has found the static balance averages for boy students as 7.69±2.49 while for girls, the value was 7.79±1.94. Loğoğlu (2002) has found the static balance averages for boy students as 4.84±4.13 and 6.06±4.23 for girls. Kızılkaşam (2006) has found the static balance averages for boy students as 6.04±4.23 and 6.06±4.23 for girls. The research results and our findings show no similarity. In our research, comparisons were made based on gender factor and significance in favor of girls in static balance was found.

Ten meters sprint results were found as 2.07±0.08 for male tennis players and 2.17±0.24 for female tennis players in our study (Table 2). Speed in sports means the most intense application of motoric actions in the shortest amount of time. Ziyagil et al. (1999) have found ten meters sprint averages as 2.62±0.13 for boy students and 2.36±2.74 for girl students. This is similar to our results. Comparisons were made based on gender factor and significance in favor of boys in ten meters sprint was found.

Ball throwing results were found as 24.28±3.68 for male tennis players and 19.71±4.82 for female tennis players (Table 2). Kuru and Köksalan (2012) have found ball throwing averages for 9 year-old kids as 14.78±4.49. The research results and our findings show no similarity. In our research, comparisons were made based on gender factor and significance in favor of boys in ball throwing was found.

Range test averages were found as 13.79±10.28 for male tennis players and 12.81±2.54 for female tennis players (Table 2). No findings about 9 to 10 year age

group kids were established in our research regarding agility range test that we used. In our research, comparisons were made based on gender factor and significance in favor of girls in range test averages was found.

In conclusion, a positive mannered relevance between the motor ability performances of 9 to 10 year old tennis players was obtained. The results also indicated that motor abilities of boys in this age group appear more distinctively than that of girls.

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