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THE RELATION BETWEEN 2D:4D FINGER LENTGH VE RATIO AND SPORT PERFORMANCES OF AMATEUR BASKETBALL PLAYERS[i]

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Abstract:
This study was conducted to investigate the relationship between amateur basketball players' 2D:4D finger lengths and their basketball performance. The study was conducted with the participation of 56 voluntary healthy male athletes who played basketball as amateurs in Amasya and whose average age is 16.0 years. Body length, body weight, vertical jump, 10-meter sprint, twisted leg push-up, 20-m shuttle running data were collected and evaluated for right-handed 2D, 4D finger lengths and ratios. The mean, standard deviation, maximum and minimum values for all findings were obtained in the evaluation of the data. Pearson Correlation Analysis Test was used to determine the relationship between finger lengths and ratio and basketball performance. There was a significant positive correlation between 2D finger length and vertical jump of amateur basketball players, anaerobic power ($P < 0.01$), push-up and 10 m sprint ($P < 0.05$); There was a significant positive correlation between 4D finger length and vertical jump, anaerobic power, push-up and 10 m sprint ($P < 0.01$), and a significant negative correlation between 2D: 4D finger ratio and 10-meter sprint run ($P < 0.05$) determined. As a result, it can be said that amateur basketball players' 2D, 4D finger lengths and speed and speed characteristics are positive, and 2D: 4D finger ratio and speed characteristics are negatively related.

Keywords: children, 2D:4D finger ratio, sportive performance, basketball

1. Introduction

Basketball is a sport branch that acquires and develops positive personality traits such as self-reliance, desire for success, enabling the organization to work in harmony, especially during the development period of children, which motivates all organisms

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and functions in terms of its characteristics. Speed and quickness are the predominant qualities of a basketball player's sporting skills, never reaching the maximum speed during the game on the basketball, and generally, repetitive short sprinting runs are more effective. For example, the ability to increase speed as quickly as possible (acceleration) is known to be the most important feature in most sporting activities such as basketball (Okur, 2011).

It is argued that in order to succeed in a sport activity, it is necessary to determine the athletes appropriate to that sport and to provide the followers of the athlete within a certain program. It is emphasized that the study of the physical and physiological characteristics of the athletes in order to realize the activities of the activity in the most perfect way (Çelenk, 2010).

Many sport branches have their own special features and athletes need to have appropriate features for each sport branch. The performance of the athletes varies according to these factors (Slater et al 2005). In order to determine the potential of the athlete, physical tests and measurements should be made to determine which tendency they are (Claessens, 1999). Determination of sportive efficiency high performance athletes at appropriate ages and orientation of their fitness according to their performance depends on different performance criteria and these performance criteria are also considered necessary for talent selection. The detection of talented athletes at appropriate ages can increase the percentage of success in that sport branch (Ağaoğlu et al, 2006).

With 2D and 4D finger ratios it is argued that some features of people can be known in advance. These characteristics can be related to issues such as physical and mental disturbances, possibilities of child possession, mental and analytical thinking, behavioral characteristics, sexual preferences, sportive performance and spore susceptibility (Voracek and Loibl, 2009). It is known that there are many factors influencing success in any given sport activity, that people have different muscles to make, percentage of body fat in different proportions, amount of bone in different proportions. It is foreseen in the scientific sense to determine the suitability of the athletes by the necessary measurements and tests. (Kuter and Öztürk, 1992)

The purpose of this study is to demonstrate the relationship and influence of 2D: 4D finger length and proportion to basketball skill.

2. Material and Method

2.1 Study Group

The study group consisted of 56 volunteer healthy male athletes active in Amasya amateur basketball clubs with an average age of 16 ± 1,58 years.

2.2 Data Collection

The data were obtained from the following tests and measurements:

2.2.1 Height and Weight

The subjects' body weights were Seca Mark with a height measuring of 0.01 kg with bare feet, T-shirt and shorts; length measurements were made by sliding calipers with the subjects adjusted to touch the heads of the floating caliper athletes while standing in a standing position. The athletes' VKI (Body Mass Index) was determined through Weight (kg)/Length $(m)^2$.

2.2.3. Finger Lengths and Ratio

To determine the 2D:4D finger lengths of the athletes participating in the study, the distance between the middle point of the line at the lower end of the finger and the peak point was measured with a 0.01 mm precision Mar Cal 16 ER Digital Caliper and the ratios were determined (Bahçelioğlu, 2002).

2.2.4 Vertical Jump

The vertical jump test of the subjects was performed with a matt type jump-meter that measures the jump height according to the airborne duration. The athletes were informed before the test, two measurements were taken and the highest value was processed in the information form. The Lewis Formula was applied to determine the anaerobic power: P = √4,9 x Body Weight (kg) x √Slice Height (m) (Günay et al., 2013).

2.2.5. Pull Up

The athletes were subjected to a 1 minute push-up test to measure strength and strength, and the children to be tested were taught before the test.

2.2.6. 10 Meters Sprint

The 10 m sprint test of the athletes was carried out with low output with the New Test 2000 brand photocell placed at the start and end points. The running test was applied twice after each athlete was rested and the highest scores were processed into the form.

2.2.7. Shuttle Run

The basketball players' aerobic endurance was measured by the 20 m Shuttle Run Test, and the necessary information was given to the children before the test. The running speed was regulated by the sound signals recorded in a cassette. When aerobic power was obtained, the VO2max estimate for the 20 m Shuttle Run Test values was used and the VO2 max was estimated in ml / kg / min from the predictive table based on the shuttle level and number (Ramsbottom et al, 1988).

2.3. Evaluation of Data

The mean, standard deviation, maximum and minimum values were obtained for all findings in the evaluation of the data and the Pearson Collateral Analysis test was used to determine the relationships between 2D, 4D finger lengths and ratios and basketball performance.

3. Findings

All the findings of the study are given in Table 1 and Table 2 below and evaluated:

Table 1: Physical and Physiological Characteristics of the Research Group

Variables	X±SD.	Minimum	Maximum
Height (m)	1.79 ± 0,90	1,53	1,97
Weight (kg)	68.32 ± 11,22	68,0	95,0
VKİ (kg/m²)	21,30 ± 2,25	15,24	26,45
Right 2D (cm)	6,55 ± 0,49	5,40	7,60
Right 4D (cm)	6,61 ± 0,45	5,50	7,40
2D:4D ratio	0,99 ± 0,04	0,90	1,08
Pull up (times)	18,0 ± 6,36	5,0	38,0
Vertical Jump (cm)	46,73 ± 9,76	23	78
Anaerobic Power (kg.m/sec)	103,20 ± 21,62	54	173
10 meters speed (sec)	2:10 ± 0:19	1:83	2:68
Shuttle run (shuttle)	23,0 ± 8,98	8,0	49,0
Aerobic Power (ml/kg/min)	28,81 ± 1,63	26,80	36,40

The groups that participated in the study were 1.79 m, 68.32 m, respectively, of height, weight, WB, right 2D length, right 4D length, 2D: 4D ratio, push-up, vertical jump, anaerobic power, 10 meter sprint, shuttle run and aerobic power respectively kg, 21,30 kg / m2, 6,55 cm, 6,61 cm, 0,99, 18,0 pcs, 46,73 cm, 103,20 kg.m / s, 2:10 sec, 23,0 shuttle and 28.81 ml / kg / min (Table 1).

Table 2: The Relation Between 2d:4d Finger Length and Ratio and Sport Performances of the Study Group

Variable	Right 2D (cm)	Right 4D (cm)	2D:4D ratio
Height (m)	0,639**	0,665**	0,067
Weight (kg)	0,488**	0,502**	0,064
VKİ (kg/m²)	0,154	0,159	0,022
Pull up (times)	0,320*	0,459**	-0,186
Vertical Jump (cm)	0,386**	0,500**	-0,134
Anaerobic Power (kg.m/sec)	0,571**	0,633**	-0,007
10 meters speed (sec)	0,189*	0,357**	-0,262*
Shuttle run (shuttle)	0,235	0,261	-0,012
Aerobic Power (ml/kg/min)	0,209	0,243	-0,024

*P<0,05;**P<0,01

When Table 2 was examined, a significant positive correlation was found between 2D finger length and height, weight, vertical jump, anaerobic power (P <0.01), push-pull and 10 m sprint (P <0.05) There was a significant positive correlation between 4D finger length and height, weight, vertical jump, anaerobic power, push-up and 10 m sprint (P <0,01), and between 2D: 4D finger ratio and 10 meter sprinting (P <0.05) it was found

that there was a meaningful negative relationship, and there was no relation among the others.

4. Discussion and Result

Essential biomaterials are important for the performance of athletes to develop and are intertwined. The success of all sports is strongly acknowledged by all, and the athletes' muscular strengths have been shown to be related to hand finger ratios (Çelik et al 2010, Fink et al 2003, Nikolay and Walker 2005, Rantenen et al 2000, Xiao et al 2005).

2D:4D finger ratio was found to be correlated with the testosterone in the negative direction (Aksu et al. 2009, Çelik et al 2010, Honekopp et al. 2006, Manning and Taylor 2001), and it was also stated that there was a direct correlation between the index finger length and the height of the estrogen hormone, and the ring finger length and the testosterone hormone height (Çelik et al 2010, Manning et al. 2002). Again, there are studies in the literature showing the relation of sport ability and achievement levels to low 2D: 4D finger ratios on both hands (Çelik et al 2010, Manning and Taylor 2001, Pokrywka et al. 2006, Tester and Campbell 2007).

Manning et al. (2007) examined the relationship between 2D:4D finger ratios between estrogen and testosterone hormones in males and females, and found that in males 2D:4D finger ratio was inversely related to testosterone concentration. They also stated that right 2D:4D finger ratio was inversely proportional to estrogen density, testosterone and sperm count.

In the study by Manining (2002) of the relationship between 2D:4D finger ratio on sporting achievement, it was noted that 2D:4D finger length ratio was lower for as team players and young team infrastructure athletes. In another comparison, national athletes were said to have a lower 2D:4D finger length ratio than non-national athletes. It was also found that the finger ratios of the soccer players were lower when the finger length ratios were compared with the control group. As a result, it has been explained that in many futures, male athletes have a low 2D: 4D finger ratio and those with a low 2D:4D finger length ratio are more susceptible to sporting branches and have a higher chance of skill.

When the correlations between Bilgiç (2015) and the effects of right hand and left hand 2D and 4D finger lengths on the sportive performance parameters were examined, the right hand and left hand 2D length and 4D length and age, body weight, height, body mass index, body fat right hand grip strength, left hand grip strength, back-leg strength, and elasticity parameters were found to be positively correlated and the relationship between maxVO2 was negative. The correlation between 2D:4D finger length ratio and sportive performance parameters was not statistically significant.

Çelenk (2010) determined the performance levels of the athletes and sedentary in the named study of 2D:4D finger ratios of elite athletes in different branches such as football, volleyball, handball, boxing, athletics, weightlifting and taekwondo in relation to some biochemical and endocrinological parameters affecting sportive performance,

power, and 30 m. As a result of comparison of sprint tests, a significant difference was found between athletic group consisting of different branches and sedanter groups in favor of sports group. The 2D:4D finger length ratio was found to be significantly lower than the sedentary in all of the experimental groups of different sports branches. In the study conducted by Gul (2018) on tennis players, a negative relationship was found between tennis athletes' right hand 2D,4D and left 2D,4D finger length and 30m speed parameter. Left and right 2D:4D finger ratios and tennis athletes were found to have a significant relationship between height, body weight, claw and arm strength, and aerobic performance parameters.

In the analysis of the relationship between the performance of the athletes of the Tetik and Koç (2016) and their finger lengths, it was found that there was no significant relationship between the athletes' 2D:4D finger length average and the competition performance. Manning et al. (2009) showed that male and female middle and long range athletes have a strong relationship with performances and 2D:4D finger length ratio. 2D:4D ratio indicates that endurance conditions are related and 2D:4D ratio predicts short distance running ability.

The study of the relationship between the physical performance levels of elite athletes and the finger ratios at hand revealed that all the athletes had lower hand finger ratios, indicating that testosterone predominance in terms of finger ratios in the athletes. However, the significant relationship between the physical performance levels of elite athletes and hand finger ratios showed that testosterone prevalence in this age group did not directly affect physical performance (Çelik et al., 2010).

Tester and Campbell (2007) found that students who participate in sport activities in the UK and actively participate in sports in the university team have a negative relationship between low 2D: 4D finger ratios and sporting abilities and achievement levels. It has been reported that the performance levels of male and female athletes (physical fitness related sports such as running, skiing, soccer, gymnastics-based shuttle, recurrent bouncing) are negatively associated with hand finger ratios (Çelik et al. 2010, Honekopp et al. Manning and Taylor 2001, Manning 2002). Fink et al. (2006) found that hand finger ratio was significantly related to hand grip strength measurement on 140 sedentary students. In comparative studies between previous ethnic groups, it has been reported that there is a relationship between the strengths of various muscle groups and hand finger ratios according to gender (Çelik et al., 2010; Nikolay and Walker 2005, Xiao et al 2005). Men with low 2D: 4D finger lengths are reported to be more successful in many sports and have a high balance and coordination ability that is a sport positive feature. Again, elite athletes have a 2D: 4D finger length ratio at a lower level than elite or young teams. These results emphasize the importance of 2D: 4D finger length ratio in determining basic motoric properties such as balance and coordination (Çelenk 2010).

2D:4D finger length ratios were found to be negatively related to performance of both male and female amateur soccer, rugby and basketball players. Therefore, studies

on subjects show that sports performance in many sport branches is related to 2D:4D finger length ratio (Çelenk 2010).

In our study, there was a significant positive correlation ($p<0.05$, $p<0.01$) between 2D and 4D finger length, vertical jump, anaerobic power, push-up and 10 m sprint and 10 meter sprint run with 2D:4D finger length ratio ($p<0.05$) were found to be negatively correlated (Table 2). Therefore, the research findings presented above (Çelik et al 2010, Fink et al 2006, Nikolay and Walker 2005, Rantenen et al 2000, Manning and Taylor 2001, Pokrywka et al. 2006, Tester and Campbell 2007, Manining 2002, Manning et al. 2007, Bilgiç 2015, Çelenk 2010, Gül 2018, Honekopp et al., 2006, Xiao et al, 2005) show that the 2D:4D finger length and ratio are significantly related to the sporting ability and basketball ability in men, supporting our results. In addition, a significant portion of our work and literature studies are in line with the linear relationship between athlete's 2D and 4D finger length and anaerobic power, strength and speed performance, and the inverse relationship between 2D:4D finger length ratio and speed performances. These results showed that 2D:4D length and proportions of males and females were significantly related to estrogen and testosterone hormones and that 2D:4D finger ratio in males was negatively correlated with testosterone concentration and that the right 2D:4D finger ratio was linear with estrogen, testosterone and sperm count (Manning et al., 2007).

As a result, it can be said that as 2D and 4D finger lengths of amateur basketball players increase, strength and speed characteristics can be increased and speed characteristics can be increased by decreasing 2D: 4D finger ratios.

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