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EXAMINING THE CORRELATION BETWEEN SOM ANTHROPOMETRIC CHARACTERISTICS AND SECON FINGER TO RING FINGER LENGTH RATION (2D:4D) OF HAND WITH SOME PHYSICAL FITNESS TESTS IN ELEMENTARY SCHOOL GIRLS, TEHRAN

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ABSTRACT

Exercise and its benefits are clear to everyone. It seems that the hand second finger to ring finger length ratio (2D: 4D) is a strong predictor for talent and ability of athletes. The researchers believe that the level of sex hormones during fetal life is effective on the length of fingers and some physical characteristics. Since the length ratio of fingers to each other does not change after birth and during the course of life, this index seems to be effective in finding the talents and the athletes' success. Thus, the aim of this study was to examine the relationship between 2D: 4D ratio and some physical fitness factors like speed test, oxygen consumption, strength, the wrist power and some anthropometric characteristics such as body mass, height and weight in elementary schools girls in Tehran. In fact, the research type was a cross-sectional descriptive survey one. Also, the study population consisted of elementary schools girls in the city of Tehran, from education districts 2, 11 and 7. From 380 students, 120 subjects were randomly selected as the sample. To determine the association between variables, the statistical method of Pearson correlation coefficient at significance level of $P \le 0.05$ was used. It is hoped that the research results will be helpful in facilitating the talent-finding and nurturing champion.

Keywords: Anthropometric Characteristics, Physical Fitness Tests

INTRODUCTION

There are many different indicators for real development and progress of countries that exercise (sport) is one of the most important ones. There are different approaches to this issue such as perspective of championship, vision of general health and vitality of the community and even economical approaches. But regardless of all, the importance of physical education and sport is increasing day by day (Physical Education Organization, 2003). Individuals' participation in the exercise leads to improvement of physical health, mental health and optimized entertainment of people (Cohen *et al.*, 2014; Sun, 2013). As exercise through reducing blood pressure, plasma fibrinogen and viscosity can improve glucose metabolism and blood fat levels and prevent cardiovascular diseases (Golden *et al.*, 2013).

Gregory and Dhaval (2013) concluded that physical activity has an ongoing impact on human health (Finger, 2014). Therefore, people participation in physical activities leads to social, cognitive and mental development, and at a higher level, it can improve fitness (Gregory and Dhaval, 2013). Also, parallel to the growth of investment in physical education and sport, considerable efforts have been also made in scientific and academic sectors for its development in most schools throughout the world (Talebpour, 2013). Since physical structure, and anthropometric properties and physiological and ecological characteristics lead to optimized and optimum performance of effective exercise activities. Therefore, identifying such factors is imperative for coaches and teachers. The present research examined the

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Research Article

association between some anthropometric characteristics and the ratio of the hand second finger to ring finger length (2 D: 4D) and some fitness tests in female elementary schools students in city of Tehran. Given the importance of the young generation of country (Iran), the students, identifying the talents and growing such potential could become a valuable support to achieve optimum results and make a lot of honors in different fields of sports in the world. The process of prediction of sport performance or finding the group of variables capable of predicting the performance is known as identifying and detection of talent. Today, predicting the future performance of a 15 years old girl or boy in the following 10 years is one of the most difficult aspects of sport science research, and the number of variables capable of affecting the potential success of young athletes is surprising. In fact, the process of discovering talented athletes is as the most important and discussed issues in today's sport championships. Achieving high levels of elite is sports is a very complex process that requires identification and recruiting talented individuals with specific physical, skills and behavioral characteristics.

Recently, some studies have introduced the ratio of second finger to fourth finger length (2D: 4D) is a strong predictor and powerful indicator of talent and athletic ability. Peeters et al., study (2013) was performed on 145 gymnasts at world class level in three different fields that their performance was found in three groups of low, medium and high. No significant differences in 2D: 4D was found between the groups; also, no relationship was seen between 2D: 4D and their anthropometric, androgenic and somatotype characteristics. They concluded that unlike other anthropometric characteristics, 2D: 4D is not a preferred factor for gymnasts' performance at world-class portfolio. In a study conducted by Dapeng (2012) in China on Han race, the 2D: 4D ratio to hand power was examined in men and women, and the results indicated that the ratio is lower in men than women; but the hand power is higher in men and the 2D: 4D ration of right hand in men has a negative correlation with this kind of power. In a study by Holzapfel et al., (2013), the low D2: 4D ratio in both hands was associated with high androgen sensitivity, which represented a small portion of three-fold repetitions of Cytosine – Adenine – Guanine (CAG) in the exon of an androgen receptor gene. Endurance exercise led to a high increase in VO2 max capacity in men with a relatively low number of CAG repeats that suggested a relationship between 2D: 4D ratio of both hands with VO2 max. They also reported that the strongest association was found between 2D: 4D ratio of the right hand and the endurance running performance, and reported an inverse relationship between 2D: 4D ratio of both hands and the VO2 max, running speed and the peak lactate concentration in boys in puberty times. The relationship between the 2 D: 4D and the endurance running performance seems to be mediated by RER max (maximal respiratory exchange). In previous studies, in a research done by Peeters et al., (2013), the relationship between 2D: 4D ratio of left hand with each of fitness components (balance, speed and motion, flexibility, explosive strength, agility, endurance) was examined and no correlation was found, and unlike other anthropometric characteristics, this ratio does not seem to be related with any fitness components in young girls. Thus, it cannot be considered in programs to find talents for sports ability in girls. In a study conducted by Mahdizadeh (2013) on 40 exercised female students with a mean age of 22 years, it was determined that there was no relationship between 2D: 4D ratio and muscular endurance, and muscular endurance cannot be predicted by anthropometrics aspects; therefore, anthropometric parameters of hand should not be evaluated for selection of female athletes. The present study aimed to examine the relationship between some anthropometric characteristics and the second finger to fourth finger length ratio (2D: 4D) obtained by some fitness tests in elementary school girls in Tehran. Since attention to the sphere of finding talents and gaining sports medals is so essential, and schools are rich environments to explore the talents and helping to develop them, and given that many champions and successful athletes have been identified in schools and then help and conducted, the present study tried to identify and detect the country's sports talents with the help of relevant officials and managers to develop them.

MATERIALS AND METHODS

The purpose of the present study was to examine the relationship between 2D: 4D ratio and some physical fitness factors such as Sergeant Test, flexibility, speed, test, oxygen consumption rate test and with some

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Research Article

anthropometric characteristics such as body mass, the difference between the second and fourth fingers length, weight and height in young boys in Tehran. In fact, it was a cross-sectional, surveying and descriptive study. The study population included female elementary schools students in education districts 1, 11 and 7 of city of Tehran that among 380 students, 120 subjects were selected randomly as an adequate random sample (Delavari, 2009). To obtain 2D: 4D ratio, the common method of drawing the hand shape with complete abduction of fingers on the paper and dividing the length of second finger by the forth finger length was used. Aerobic fitness was measured by using a 27 meter running test. The Shuttle run test, back and forth, was used to estimate maximal oxygen consumption. The wrist strength was measured by a Dynamometer, while sit-up and tow-hand swimming tests were used to measure muscular endurance. The BMI was obtained by dividing body weight in kilograms by square of height in standing position in cm. To determine the relationship between variables, the Pearson correlation coefficient at significance level of $P \le 0.05$ was used.

RESULTS AND DISCUSSION

For normalization, the Kolmogorov-Smirnov test was used, indicating a normal and favorable situation for data.

Interested in re-participation			Variable
Number	Correlation coefficient	Significance level	
120	0/33	0/12	Standing position height - 2D: 4D ratio of left hand
120	0/73	0/276	Weight - 2D: 4D ratio of left hand
120	0/15	0/43	Speed - 2D: 4D ratio of left hand
120	0/78	00/0	Wrist muscular strength - 2D: 4D ratio of left hand
120	0/79	0/32	Oxygen consumption rate - 2D: 4D ratio of left hand
120	0/22	0/549	BMI - 2D: 4D ratio of left hand
120	0/78	0/07	Muscular endurance - 2D: 4D ratio of left hand

Table 1: The results of correlation test between anthropometric variables - Fitne	ss tests	and the	2D:
4D ratio of left hand			

P≤0.05

According to the Pearson test results, only the hand-wrist muscular strength - 2D: 4D ratio of left hand at obtained significance level was less than 0.05; thus the null hypothesis is rejected and the opposite hypothesis is confirmed. Then, with 95% confidence, one can say there is a significant relationship between hand-wrist muscular strength and the 2D: 4D ratio of left. Their degree of correlation was equal to 0.89, which is a very high value.

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Research Article

Discussion & Conclusion

The present study results showed that among some anthropometric characteristics and the hand second finger to ring finger length ratio (2D: 4D) and some physical fitness tests on elementary school girls in Tehran, a significant correlation was only seen between the hand-wrist muscular strength and the 2D: 4D ratio of left.

The present study results are inconsistent with Holzapfel et al., research in which it was reported the strongest relationship was seen between the right hand with endurance running performance, while an inverse relationship was between the 2D: 4D ratio of both hands with VO2 max, the running speed and the peak lactate concentration in boys during puberty, and the relationship between 2 D: 4D ration and endurance running. But it is consistent with Peeters et al., (2013) study, in which the relationship between 2D: 4D ratio of left hand with each of fitness components(balance, speed and motion, flexibility, explosive strength, agility, endurance) was examined and no correlation was found between the ratio of 2D: 4D of the left hand and mentioned components. It is also consistent with Mahdizadeh research, which indicated that there is no relationship between 2D: 4D ratio and muscular endurance, and muscular endurance cannot be predicted by anthropometric dimensions. The current study revealed a significant relationship between the wrist muscular strength and the ratio of 2D: 4D with a good correlation, which is consistent with Dapeng Zhao research (2012) that reported a significant relationship between the ratio of 2D: 4Dand the hand strength. Ultimately, it can be concluded that attention to anthropometric characteristics in finding sporting talent, in particular considering the ratio of 2D: 4Din sports directly related to the wrist and its power and strength would be useful. It is suggested that in a research with a larger statistical sample, the relationship between the 2D: 4D ratio with the above anthropometric characteristics and fitness examinations will be further investigated. It is suggested that in another research, the present research variables will be further studied in other age ranges and in different groups.

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