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Research Article

STUDYING THE RELATIONSHIP BETWEEN BODY MASS INDEX WITH SPEED, AGILITY AND BALANCE IN MALE STUDENTS OF 15-13 YEARS OLD

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ABSTRACT
The purpose of this study was to evaluate the relationship between anthropometric indexes (height, weight and body mass index) and motor fitness factors (speed, agility, balance) of guidance-school male students (13 to 15 years old). The statistical population included 1413 male students out of which, 150 were selected through purposive sampling method from three schools. This research is a descriptive and co-relational study performed to evaluate the obtained diagrams, charts, descriptive statistics, mean and standard deviation. All data collected by SPSS software version 18 was analyzed statistically. It was found that there was a significant inverse relationship between weight and static balance speed, but no correlation between height and speed, height and agility, as well as between body mass index and speed. Finally in exercises such as gymnastics and diving, which require balance, the negative factors as height and BMI and overweight are considered to be limiting ones.

Keywords: *Anthropometric Characteristics, Physical Fitness, Height, Weight, Agility, Balance and Speed*

INTRODUCTION
Today, we see that in order to improve the performance of their athletes, exercise educators and teachers evaluate them in terms of healthcare, physical and movement as well as skills fitness according to a timetable. Given the nature and variety of athletic skills, stamina and player movement, as well as having some anthropometric characteristics and appropriate physical capacity, it is considered as one of the success factors in the sports scene. In addition, factors such as the size and performance indicators of motor skills in the tendency of people to a specific sport play an important role. While many parents want their children to experience success in sports and even some of them like to see their children in high-level sports championship and expectations of the international community also implies the presence of athletes in various sports has grown, it requires the identification and selection of talented people who have physical, requirements behavioral and motor skills for success in their particular sports. The process of discovering talented athletes to participate in an organized training program is one of the most important and most valuable topics that have been proposed in sports today. Everyone can sing, paint or play a musical instrument or a sport to learn, but few people achieve a high level of skill. So in physical education and sport in the form of art, discovering and selection of young talents and then their guidance, supervision and monitoring and evaluation to promote the highest level of skill is of extraordinary importance (Kazemei *et al.*, 2006).

Based on available evidence, it is more than fifty years that the teachers informally seek to fined talented people and assess their physical condition, but until the 1970s that the Eastern European countries, particularly in East Germany, Russia and Bulgaria had a talent show, there was no such plan in any country, thus finding talented people is relatively long (Kazemei *et al.*, 2006). The results obtained in these countries were unimaginable and amazing. Most people who got medal at the Olympic Games in 1972 were scientifically selected from especially from East Germany. This also applies in the case of Bulgaria in the 1976 Olympics. Almost 80 percent of those got medals were the result of talent identification process (Zapartdis *et al.*, 2009).

In 1980, a similar program for athletic talent was conducted in Western Europe, North America and some other CIS countries. But many problems arose for these countries due to the lack of sports facilities and sports capabilities upgrades centers. Therefore, specific criteria should be taken into consideration to

make talent finding process scientific in the sports, including physical and mental health benefits, having good anthropometric measurements, having prominent inherited features, having adequate sports facilities, providing suitable environmental conditions and finally the access to sports science experts (Kazemei *et al.*, 2006).

Motion capabilities such as speed, agility, balance, which the concept of movement has been considered have a wide range in different sports and play an important role in implementing excellent motor skills (Zapartdis *et al.*, 2009). Motion speed is considered a required physical capability for high levels of performance in many sports. Speed is the amount of movement or the distance by one of the body limbs or the whole body. Most coaches in primaries tend to be aware that whether the athletes in sprinting or other activities are faster or not (Markovic *et al.*, 2005). Velocity component include reaction time, acceleration, maximum speed, endurance in speed and movement time that speed test in this research relates to movement time (Gal *et al.*, 2008).

Agility factor is very important factor in most sports. The athlete should be able to have great maneuverability. The ability of individuals to change fast moving, with balance and understanding of the position indicates one's high agility (Kazemei *et al.*, 2006). Balance is the ability that is extremely important to move for various sports movements (Kazemei *et al.*, 2006) balance is of two kinds. Dynamic balance: Maintaining the stability of the support level while a move described runs. Static Balance: the ability to maintain the center of gravity in the range of support (Sadeghi *et al.*, 2010).

On the other hand, structural and physical capacities (such as body mass index) are the qualifying criteria are factors that affect the fate of the athlete.

Through body measurement, sports scientists will be able to gain the necessary information about the physical form, physical fitness and physical condition of athletes (Zapartdis *et al.*, 2009). Many accurate predictions about individual and team performance over the past two decades have been solely based on height and body mass. According to many experts, anthropometric indices or physical and size dimensions is of the determining factors in the exercise and has dramatically been included in the new talent finding (Kazemei *et al.*, 2006). The importance expressed about the anthropometric indices and physical fitness capabilities to predict the future of sport has forced the researcher to examine the relationship between these two aspects.

MATERIALS AND METHODS

Research Method

This is a descriptive-correlational study which aimed to investigate the relationship between some physical fitness factors (speed, agility, balance) with body anthropometric measurements (body mass index) in male students with 13 to 15 years old.

Research Community

The study statistical community consisted of all male students aged 13 to 15 at Soran city. Sampling method is in cluster ransom method which first three schools and then several classes from each school were randomly selected. The research sample volume was calculated 150 people given the total number of male students aged 13-15 years at Soran city and using Morgan's Table.

Measurement Method of Research Variables

BMI: body mass index was calculated as weight in kilograms by the square of height in meters.

Speed: it refers to the relative time spent in doing so. In other words, the shortest temporal distance that the person can move body or part of it one or more times in the space movement voluntarily.

Due to limited space in schools and for more safety, 36 m running is used in this study. The subject start their fast running from the back of the line previously drawn by calling on their own place and by lowering the flag by the starter and the time as seconds and hundredths of seconds as the final record was recorded after crossing the finish line.

Agility: Agility is the ability to quickly change direction and speed while maintaining balance and understand the situation. In other words, the ability to change the status and the body movement direction voluntarily in the minimum time is called agility.

Round running test 4*9. Round running test 4*9 is among AAHPERD tests which has a high reliability and is used in most studies. The test is performed in the limited space of the school. It was done within a distance of 9 meters in length between the lines sweep in two stages in that after removing the rectangular cubic wood in the dimensions of 5*5*15 to the place of returning place and by placing the first wood in the back of the line on the ground (without throwing up), the subject will move to the second wood and after taking it up from the ground, they cross from the starting line quickly and without putting it on the ground. The record was recorded in seconds and hundredths of seconds.

Balance: maintaining the body status in the stationary state depends on the stationary balance.

The test of standing on one leg: This test is used to measure the static balance. This test has been used in most studies and is considered as standard tests of AAHPERD. Its conduction method is very easy and has a high safety in the way that the subject stands on the top of one's higher leg and put other leg's toes on higher knee. Then rises the higher leg on the heel by the stand-up command and while stands on one leg's toes, they try to maintain their balance without moving the leg or separating the hands from the knee. The test was repeated three times and the score of this test was calculated based on the number of errors and the time to come.

Conduction Method

The current study was done in field method. After the administrative coordination and legal requirements, they referred to school a few days before the test and regarded classes and students were chosen by the coordination of school administrators and exercises' teachers. Also consent letter health forms to participate in research were collected, signed and taken by subjects' parents. All measurements were done in the morning, at the hour of students' physical education. The procedures in this case were that first the height and then the weight of students was measured. The tests were as follows: speed running (36 m), Stationary balance (stork) and agility (9□ 4). Also, proper warm-up and cool down and needed break interval of the subjects were taken into consideration. Of the confounding variables, both physical and mental health students who disapproved and also those who were not interested in participating in this project can be indicated, which these people were removed from the list and instead other eligible persons were randomly selected and replaced.

RESULTS AND DISCUSSION

Findings

Table 1-1: Descriptive statistics for the scores of all subjects in research variables

Test	Minimum	Maximum	Mean	Standard Deviation
BMI	**21.8**	**37.38**	**23.8**	**4.23**
Agility (seconds)	**8.63**	**13.96**	**10.25**	**0.78**
Speed (seconds)	**5.09**	**9.67**	**5.65**	**0.59**
Stationary Balance (second)	**1.23**	**48.35**	**8.55**	**11.83**

Table 2.1: Pearson correlation test results to assess the association between body mass index and speed

Variables	Number (N)	Correlation coefficients (r)	significance level (Sig)
Body mass index and speed	**150**	**-0/004**	**0/964**

p< **0/01** ** , p< **0/05***

According to Table 2.1 it can be seen that there is an inverse significant correlation between body mass index variables and research subjects' speed with correlation coefficients (-0.004) (P=0.964).

Table 3-1: Pearson correlation test results to assess the relationship between BMI and agility

Variables	Number (N)	Correlation coefficients (r)	Significance level (Sig)
BMI and agility	**150**	**-0/31**	****0/001**

p< **0/01****, p< **0/05***

According to Table 1.3, it can be seen that there is an inverse significant correlation between body mass index variables and agility of the research subjects with correlation coefficients (-0.31) (P=0.001).

Table 4-1: Pearson correlation test results to assess the relationship between BMI and balance

Variables	Number (N)	Correlation coefficients (r)	Significance level (Sig)
BMI and balance	**150**	**-0/124**	***0/013**

p< **0/01** ** , p< **0/05***

According to Table 1.4, it can be seen that there is an inverse significant correlation between body mass index variables and balance of the research subjects with correlation coefficients (-0.124) (P=0.013).

Discussion

The research results indicate that there is an inverse significant relationship between body mass index and speed. Some research has been done in this regard prove the accuracy of these assumptions. Ziaie (2007), reviewed body mass index and physical fitness in 513 medical students. One result of the study was that there is an inverse significant correlation between physical fitness tests in each male and female group and weight, body mass index, percent of body fat, and waist-hip ratio. This result is consistent with the results of the present study (Ziaee *et al.*, 2007). Taghinejad (2013), reviewed the relationship between anthropometric measurements and physical fitness factors of female students in Shiraz and explained the inverse significant relationship between weight and body mass index with speed that is quire consistent with the results of this study (Taghinejad, 2013). Shafizadeh (2010), reviewed the relationship between anthropometric parameters among youth at football schools with their individual skills. This study investigated the relationship between heights, weight and body mass index of teenagers with their individual skills. Results associated with this assumption indicated the significant inverse relationship between weight and running skill among 10 and 11 year olds that is consistent with the results of the second and third hypothesis (Shafizadeh, 2010).

Amirian and colleagues (2007), investigated body composition and physical factors in elite wrestlers with non-sporting people. In this study, the percentage of body fat, body weight without fat and body mass index and physical tests of strength, speed and agility were evaluated. Because there was an inverse significant relationship between speed with body weight and BMI. Light-weighted athletes have generally more acceleration which is consistent with the results of research (Aminian *et al.*, 2007). Tayebi and colleagues (2010), reviewed volleyball training effects on body composition, physical fitness and their solidarity among the beginner adolescents. Measurable variables were (height, weight, body mass index) and the physical fitness tests. No significant correlation was observed between factors of body composition and each of the tests chosen which was not consistent with the results of the present study (Tayebi *et al.*, 2010).

Based on the results obtained and the consistency of the results of this study, it is concluded that BMI factor has a significant negative correlation with recorded running speed. In fact, the running speed record is weakened with a high body mass index. Speed factor is of important physical fitness factors in most sports fields. BMI is also a standard indicator for identifying overweight, underweight, ideal weight and obesity and is directly related to one's weight. Most research in this area indicates that higher body mass index has a weak sport performance (Taghinejad, 2013). The results indicate that there is an inverse significant correlation between BMI and agility record. Bahpour and colleagues (2002), reviewed the relationship between body type and body composition and performance in the basic movement patterns

and components of soccer basic skills. Relationship between endomorph, mesomorph and ectomorph body type and body composition variables were along with the performance of the basic movement patterns and performance skill. Measured parameters included the 'height, weight, skinfold fat, 36 m running and 9 × 4 m running agility and dribbling test ". The obtained results showed that increased endomorph and increased weight in subjects causes weakening their performance in certain subjects such as dribbling and agility test that is consistent with our results (Behpoor *et al.*, 2002). Also, it is consistent with the research results of Rahmaninia (2009), Ziaie and colleagues (2007) about the body mass index. In addition Moghadasi and colleagues (2011), reviewed the prevalence of overweight and obesity and fitness levels among adolescents at Shiraz city in 2010 and finally obtained a significant inverse relationship between the factors of physical fitness and body fat percentage and body mass index which was consistent with the current research results. The research results of Tayebi and colleagues (2010) are not consistent with the results of this research.

On the other hand, Garajian (2002), conducted a study on high school students at Neishabour city and concluded that the correlation between body mass index and speed and agility is not significant, which is not consistent with the results of the present study.

Agility is one of the sport factors in most fields. One reason for agility improvement can be attributed to the weight to be shifted easily in exercises. Because BMI is directly associated with weight and given the body mass index, and the results according to specified standards lose weight, overweight, normal weight and obesity can be estimated, and as previously mentioned; too much weight will cause the athlete to carry the extra load during operation, causing poor performance and ultimately reduce the agility of a person.

The result of this research implies that there is an inverse relationship between BMI and the balance. The results of this study are consistent with the ones obtained by Taghinejad (2013), Ziaie (2007) and Salimi (1997). The results of this study are not consistent with the results of Shahheydari and colleagues (2012).

Balance is an important factor in most sport fields. Athletes can have better performance in various sport positions with an optimal balance. Based on the factors affecting the stability and balance, the shorter a person and the closer is the center of gravity to the ground and the more balance and since BMI can be achieved by dividing a person's weight to weight square, the balance is reduced with increased body mass index, while according to biomechanical rules, the more the weight, the more is the stability and balance. But if the weight distribution is located above the gravity center, imbalance is created.

Speed, agility and balance are essential factors in most sports that have a significant inverse relationship with BMI. Therefore, it should be planned in training programs to improve these three factors and also body mass index and to reach optimal weight. Lack of relationship between weight factor with two variables of agility and speed indicates that the success of these two variables is related to other factors. Height factor and can be ignored. Thus, height factor is not important in finding talents in these ages regarding running speed and agility. Overweight, that body mass index also increased, will be led to reduced performance because it causes overweight.

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