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Full Length Research Paper

Body composition and standing long jump in young men athletes aged 6-13 years

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The aim of this study was to evaluate the relation between anthropometric parameters and the standing long jump in young men athletes. 96 boys aged 6-13 yrs participated and factors such as BMI, the waist perimeter and the sum of four skinfolds were measured and compared with single, triple and fivefold standing long jump. The BMI was calculated as kg/m^2, the sum of four skinfold was measured with a Brondie's type skinfold caliper and waist perimeter was measured at the level of the hips by using a tape. Single jump seems to have a significant positive correlation to the triple (r=0.613, p<0.001) and the fivefold jump (r=0.628, p<0.001). Single jump was also significantly negative correlated with skinfold fat (r=-0.226, p=0.025) but no significant correlation to BMI (r=-0.153, p=0.133) and waist perimeter (r=-0.130, p=0.201) was found. Triple jump was positively correlated with the waist perimeter (r=0.231, p=0.022) but it didn't have any correlation with BMI or the skinfold fat. Fivefold jump was positively correlated with the waist perimeter (r=0.229, p=0.024) whilst no correlation was found with BMI and the skinfold fat. The results seem to be controversial. Fat was negatively correlated with single jump; waist perimeter and weight were positively correlated with triple and fivefold jump whereas BMI seems to have not any correlation with any type of standing long jump.

Key words: BMI, anthropometric factors, standing long jump, physical fitness

INTRODUCTION

Long jump has been a subject of research in many studies until nowadays. (Clark and Phillips, 1989; Horita et al. 1991; Jensen et al. 1994) Most of the studies refer to the biomechanical and kinematical characteristics of high class athletes and only few of them refer to young athletes. They mainly focused to biomechanical long jump characteristics such as velocity and angle of lifting, the torque and the distance of lifting (Clark and Phillips, 1989; Horita et al. 1991; Jensen et al. 1994).

In the last decades, information about the relationships between body composition and physical fitness in children from developed countries has been published (Sollerhed et al. 2008; Linthorne et al. 2005; Muraki et al. 2005). In an era where overweight and obesity are increasing (Flegal et al. 2002), we should focus on how these parameters affect total physical ability of children who do not train in a professional level.

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This study includes young men athletes aged 6-13 years old and studies standing long jump. The measured factors are mostly anthropometric characteristics (waist perimeter, BMI) which mainly concern the body composition. We did not refer to the weight as a separate factor because this included to the Body Mass Index. Furthermore weight is directly related to the age of the participants. All these factors can give us an integrated view of how the standing long jump, which is a parameter of physical fitness, can be affected and lead us to valuable conclusions about the capability of a young athlete to become a professional, depending to his body composition.

PATIENTS AND METHODS

Anthropometric parameters and health related physical fitness were assessed in 96 boys aged from 6 to 13 years old who participated in this analysis (Table 1). Three indices of body composition were obtained from the anthropometric measurements that were performed in accordance with the protocol of the International Society for the Advancement of Kinanthropometry (ISAK) (Norton

Table 1. Demographic and Anthropometric Data

Country	Greece
Mean Age	10.03±1.9
Height (m)	1.44±0.206
Weight (kgr)	42.06±14.12
BMI (kgr/m^2)	19.65±4.07
Waist Perimeter (cm)	70.71±13.41

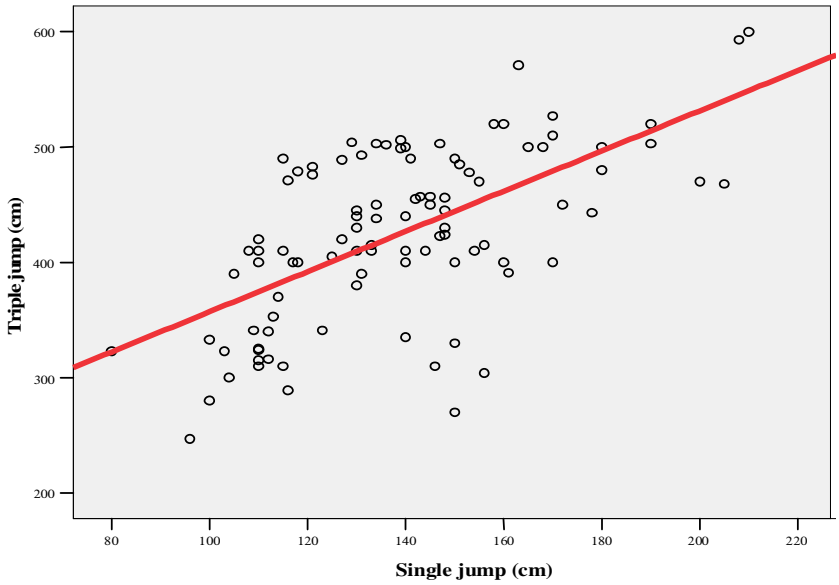

Figure 1. Correlation between single and triple jump

and Olds, 1996). We compared their ability for single, triple and fivefold standing long jump along with other parameters such as BMI, waist perimeter and the biceps fat. The best out of three trials was recorded for each different type of long jump. The sum of four skinfolds was calculated using measurements taken at the triceps, biceps, subscapular and suprailliac.

We did not consider the age to be a constant parameter (6-13 integers) and that is why we used a non parametrical method (instead of Pearson's coefficient r). The BMI (Body Mass Index) was calculated as Kg/m^2. The thickness of four skinfolds was measured with a type Brondie skinfold caliper. Circumferences of the waist (at umbilicus height) and hip (at the level of the greatest posterior protuberance of the buttocks that usually corresponds anteriorly to about the level of the symphysis pubis) were measured with a flexible steel tape to the nearest 0.1cm.

Before the beginning of the study, invitation letters were sent to the parents for passive consent to participate in the study. The young athlete's participation was totally voluntary even with the parent's consent and all procedures were approved by the authority of the university hospital. All analyses were performed with SPSS version 13.0.

RESULTS

In this study, single jump has a significant positive correlation to the triple (r=+0.613, p<0.001) and the fivefold jump (r=0.628, p<0.001) which leads to the conclusion that the triple and the fivefold jump will be longer if the first jump is long too (figure 1). Single jump was significantly negatively correlated with sum of four skinfolds (r=-0.226, p=0.025) but no significant correlation to BMI (r=-0.153, p=0.133) and waist perimeter (r=-0.130, p=0.201) was found.

Significant positive correlation was also found between triple jump and the waist perimeter (r=0.231, p=0.022) but there was no correlation between the triple jump and BMI or the sum of the skinfold (figure 2).

Significant positive correlation was also found between fivefold jump and the waist perimeter (r=0.229, p=0.024) (figure 3) but once again we did not find any correlation to BMI and the sum of the skinfold 's fat

The statistical analysis leads to the conclusion that BMI do not affect a standing long jump in any way, when waist perimeter affect the standing long jump especially the triple and fivefold jump. In these particular jumps, we made an exception and by using the weight as an anthropometric factor we found that it affects positively the triple (r=0.323, p=0.001) (figure 4) and the fivefold jump (r=0.304, p=0.002) while it plays no role in the single jump (r=-0.001, p=0.990).

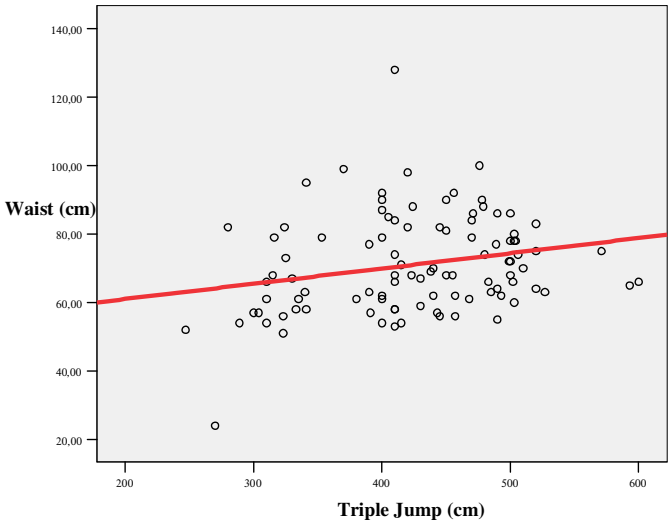

Figure 2. Correlation between waist perimeter and triple jump

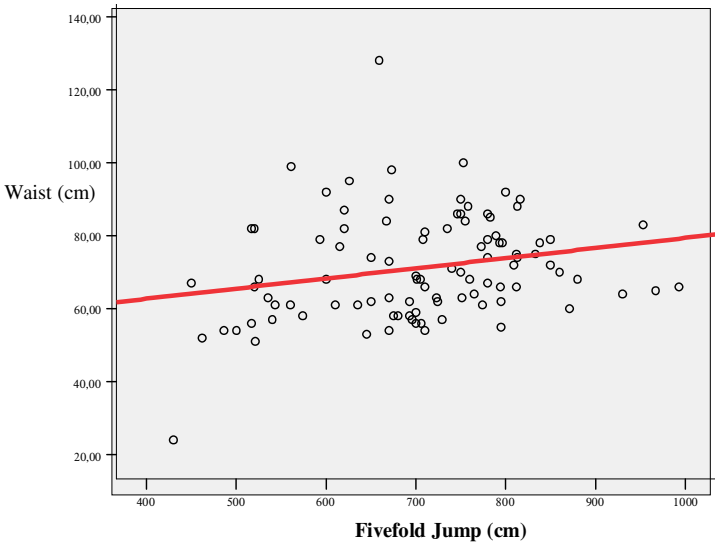

Figure 3. Correlation between waist perimeter and fivefold jump

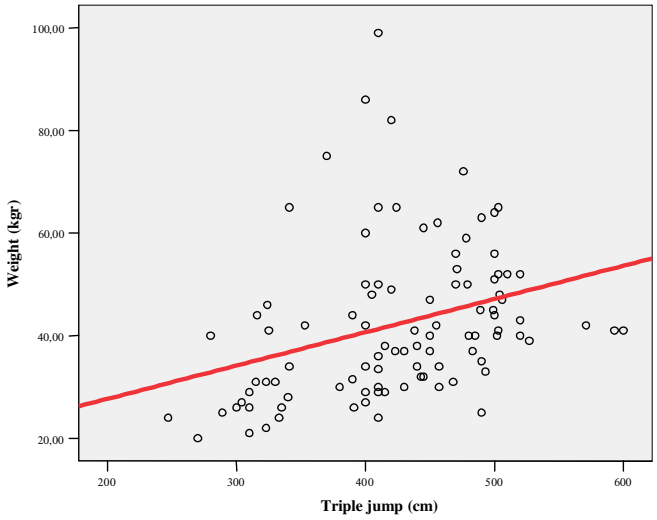

Figure 4. Correlation between weight and triple jump

DISCUSSION

The results of this study indicates that only some of the body composition parameters are in line with the performance of the standing long jump when the rest of them influence the performance with a different way. In this particular study 96 boys aged 6-13 years took part and their ability for jumping in connection with dynamical and anthropometric characteristics has been studied. The purpose of the study was to analyze the affection of fitness parameters such as BMI, waist perimeter and skinfolds fat have in the performance of a single, triple and fivefold standing long jump. In contrast with other studies that have been done until now, we focused mainly to young men athletes rather than in high class athletes (Kamtsios and Digelidis, 2007; Milanese et al. 2010; Monyeki et al., 2005). The reason we focused in young men athletes aged 6 to 13 years old was that the factor “experience”, which characterizes a mature and high level athletes, plays very little role in these ages. This leads to more accurate conclusions, referring to the correlation between the anthropometric characteristics that we are used and the ability of jumping. Conclusions about how total physical fitness is affected from these parameters in children can be made too, as standing long jump has been marked to be an index of total physical ability (Milanese et al., 2010; Eurofit 1992). Another reason we studied boys older than 6 years old was because younger have immature joints and also humans have not attain master patterns of standing long jump until the age of 5 or 6. In addition, we included only male athletes so as to avoid the difference of physical ability between males and females, which is due to the muscular growth of young boys.

Referring to single jump, it was found to be positively correlated to the triple ($r=0.613$, $p<0.001$) and to the fivefold jump ($r=0.628$, $p<0.001$). This was a presumable result while total jumping ability does not differ from one jump to another. That means that if someone’s single jump is big, triple and fivefold jumps would be even bigger. It is wise of course to mention that many anthropometric parameters affect jumping ability and differ from jump to jump as it is seen in many researches concerning standing jump (Taylor and Baranowski, 1991) and long jump (Butcher and Eaton, 1989) as well. For example weight and waist circumference have been found to affect only the triple and fivefold jump in a positive way which is contrary to the common knowledge while the bicep’s fat affects only the single jump.

By the statistical analysis we concluded that the sum of four skinfolds affected only the single jump, in a negative

way (r=-0.226, p=0.025) and did not have any affection in the triple and fivefold jump where many others biomechanical factors may play a stronger role such as velocity and balance.

The use of the waist circumference as a factor affecting the standing long jump lead to the conclusion that it positively affects the triple (r=0.231, p=0.022) and the fivefold (r=0.229, p=0.024) jump while it plays no role in the single jump. If we assume that the waist circumference is a fatness parameter, this finding comes in contrary with many previous studies (Mak et al., 2010; Deforche et al., 2003; Kamtsios and Digelidis, 2007). In these studies, factors such as body size and weight were negatively correlated to motor fitness tests, where the body is projected or work is performed against gravity (standing long jump) (Milanese et al., 2010; Butcher and Eaton, 1989). The association between those factors and motor skills was found to be relatively low especially in the youngest athletes (Silva et al., 1984; Ball et al., 1992). In general, fatness affects negatively health and physical fitness (Cureton et al., 1995; Malina et al., 1995; Pate et al., 1989; Taylor and Baranowski, 1991), due to the inability of obese people to carry their weight. To confirm our findings we made an exception by using the weight as an anthropometric factor where we found that it also positively affects the triple (r=0.323, p=0.001) and the fivefold jump (r=0.304, p=0.002), while it plays no role in the single jump (r=-0.001, p=0.990). In this case we can conclude that the combination of the waist circumference and the weight may be an indicator of fatness in Western countries and older people, whereas in a population like ours this combination may reflect a higher muscle mass. The results of this analysis are very interesting, referring to the waist circumference and the weight and spare thoughts about the characteristics that we should use to the selection of young athletes.

In contrast to last findings we found no correlation to BMI with any kind of jumps. According to our study, BMI should not be used as an indicator of muscle mass (Milanese et al. 2010; Eurofit, 1992) because it doesn't seem to affect in any way standing long jump. We agree that standing long jump is affected by the growth of the muscles whereas the best indicator seems to be the waist circumference and the weight while BMI does not seems to play any role to the performance. Several previous studies (Tokmanidis et al., 2006) have shown the negative correlation between BMI and motor skills but they have depended on sample of children with high prevalence of obesity. In undernourished children, BMI was positively related to the physical ability as it was more an indicator of muscle mass in children (Milanese et al., 2010; Eurofit, 1992). This observation suggests that BMI should not be used to assess the physical ability of children as it is related to the muscle mass in normal range and the percentage of fat as well in overweight and obese children (Milanese et al., 2010).

CONCLUSION

In conclusion, in our study we examined 96 young men athletes concerning their BMI, waist perimeter and skinfold's fat and we analyzed their ability of single, triple and fivefold jump. We could say that through these tests we examined their total physical ability, as standing long jump is a main factor of total physical fitness. Our observations led us to conclude that BMI should not be used in young athletes as an independent factor for motor skills, while waist circumference and weight, even though they were found to be positively correlated with the performance of triple and fivefold jump , they should be carefully used. Considering that all previous studies have not yet concluded about the way all these factors affect standing long jump and physical activity, we believe that this study will help many questions to be answered and many future researches to study all these anthropometric characteristics that affect total physical ability of young men athletes.

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