



Relationship between Anthropometric Characteristics and VO₂ Max among Young Male Taekwondo Players Residing in BKSP, Dhaka

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Abstract

Purpose: The purpose of this study to investigate the relationship between anthropometric characteristics and VO₂ Max in young male Taekwondo players.

Methods: A descriptive ex post facto design was conducted in Bangladesh Kria Shikkha Protishtan (BKSP). Age range between 15-20 years among 13 male taekwondo players took part in this study. A valid cooper test and four skin fold method was used to measure the VO₂ Max and body fat percentage. The statistical analysis was done by Pearson correlation test.

Results: The mean body fat percentage among the participants was 22.80±4.583 and the mean VO₂ Max was 2792.31±221.591. However, there was a negative correlation found between VO₂ Max and body fat percentage ($r=-0.463$) and showed as not significant ($p=0.111>0.05$). More than two third of the participants was reported very good VO₂ Max whereas a significant correlation was found between VO₂ Max with age ($r=.563$, $p=.0453<0.05$) and BMI ($r=-.643$, $p=0.018<0.05$)

Conclusion: It is concluded that VO₂ Max is influenced by age, body mass index, and body fat percentage in taekwondo players. Every taekwondo players as well as others athletes should have needed to increase the capacity of VO₂ Max for achieving a good performance.

Keywords: Anthropometric Characteristics, Body Mass Index, Body Fat Percentage, VO₂ Max

Abbreviations: BF%: Body Fat Percentage; BMI: Body Mass Index; BKSP: Bangladesh Krira Shikkha Protishtan; FFM: Fat Free Mass; VO₂ Max: Maximum Volume of Oxygen

Introduction

Aerobic capacity of athletes is the key factor of success in sports achievements. Anthropometric characteristics such as age, Body Mass Index (BMI), and Body Fat Percentage (BF%) affect VO₂ max as well as the cardiovascular status of the athletes [1]. VO₂ Max is the highest rate of oxygen consumption attainable during maximal exercise [2]. Body composition and maximal

oxygen consumption are essential indicators of good physical fitness in players [3,4]. Good physical fitness increases performance and reduces the sports injury [5]. The capacity of VO₂ Max of an individual also represents the performance in the field of different sports [1]. Most of the studies report that well-developed muscle component (mass) and a low percentage of subcutaneous adipose tissue are predictors of better sports performance [6,7]. The fat of the human body regulates physiological and medical importance. The body fat includes the entire content of chemical fat or lipids in the body, and the Fat-Free Mass (FFM), which includes all the rest of the body apart from fat [8]. There is a close relation remain between the anthropometric characteristics and aerobic, cardiovascular fitness. To decrease body fat, there is an increase in aerobic fitness [1]. Regular exercise brings to improve body

composition and cardiovascular fitness. This research is going to examine the relationship between the anthropometric characteristics and VO₂ Max among taekwondo sports persons of BKSP. However, there is still no report regarding maximal oxygen consumption and its correlation with body components in Taekwondo players in our country. Among many factors like physical fitness and endurance of the players are the most important ones. The aim of this study was to quantify the BF% and VO₂ Max in young male Taekwondo players and to investigate the correlation between Anthropometric characteristics and maximal aerobic consumption.

Taekwondo

Tae Kwon Do (also known as Taekwondo) is originated in Korea. It is known as an art of self-defense and one of the ancient forms of art in the world reaching back over 2000 years. Taekwondo means Tae (foot), Kwon (hand), Do (art). One of the earliest clues of the Tae Kwon Do is a mural painted on the wall of a tomb constructed between 37 BC and 66 AD in the Korean Kingdom of Koguryo [9].

Defining VO₂ Max

VO₂ Max is the greatest amount of oxygen that a person can receive and spend during one minute of exercise. The VO₂ Max value is a direct pointer of the skill to provide the force for

muscle contractions during the process of anaerobic exercise. Therefore, it is considered that maximum oxygen consumption is a major measure that indicates the functional capacity of the cardio respiratory system [10].

Materials and Methods

Study Design and Participants

The present study is descriptive and ex post facto design. Thirteen subjects were selected from male Taekwondo players of BKSP. Age range 15-20 years of the participants who had a minimum six months of experience residing in BKSP took part in this study. After securing institutional ethical approval, the subjects were informed about list procedures and then were asked to provide written consent.

Measurement of VO₂ Max by Cooper Test

To find VO₂ Max uses the calculation below: (Distance covered in metres - 504.9) ÷ 44.73. This test is designed to be calculated on a track with clearly marked distance. Perform a short warm-up about 10 to 15 minutes of low to moderately strenuous activity before performing a fitness test. When you are warmed up, get going. Run or walk as far as you can 12 minutes. Record the total number of miles or kilometers you traveled in 12 minutes [11] (Table 1).

Age	Gender	Very Good	Good	Average	Bad	Very Bad
13-14	Male	2700+m	2400-2700m	2200-2399m	2100-2199m	2100-m
15-16	Male	2800+m	2500-2800m	2300-2499m	2200-2299m	2200-m
17-19	Male	3000+m	2700-3000m	2500-2699m	2300-2499m	2300-m
20-29	Male	2800+m	2400-2800m	2200-2399m	1600-2199m	1600-m
30-39	Male	2700+m	2300-2700m	1900-2299m	1500-1999m	1500-m
40-49	Male	2500+m	2100-2500m	1700-2099m	1400-1699m	1400-m
>50	Male	2400+m	2000-2400m	1600-1999m	1300-1599m	1300-m

Table 1: VO₂ Max at Different ages (According to Cooper test).

Measurement of BF %

BF% is measured by sum of four skin folds like Biceps skin fold (Front side middle upper arm), Triceps skin fold (Back side middle upperarm), Subscapular skin fold (Under the lowest point of the shoulder blade), Suprailiac skin fold (Above the upper bone

of the hip). The skin fold estimation methods are based on a skin fold test, also known as a pinch test, whereby calipers accurately measured a pinch of skin at several uniform points on the body to assess the thickness of the subcutaneous fat surface. The equipment used for measuring selected skin fold by Harpendon skin fold calipers to the nearest 0.1 mm at a standard pressure of 10 [12].



Statistical Analysis

Descriptive statistics (mean ± standard deviation) were calculated for directly measured and extracted. The Pearson correlation coefficient was used to determine the relationship between the variables. All statistical analysis was performed using SPSS version 20. P<0.05 was considered statistically significance.

Results

Table 2 reveals that the mean age of the participants was 16.69±1.316 in age range 15-20 years. According to BMI, the mean BMI was measured by 20.38±2.673 that represents the normal body weight. By four skin fold method in the measurement of BF%, the mean BF% was 22.80±4.583. Regarding VO₂ Max, most of the participants were identified as excellent VO₂ Max (84.6%) followed by above average (7.7%) and average (77%) respectively as shown in Figure 1. Table 3 represents correlation test between VO₂ Max with age, BMI, and BF%. There is a significant positive correlation was found between VO₂ Max and age (r=0.563, p=0.0453) as well as significant negative correlation was found between BMI and VO₂ max (r=-0.643, p=0.018). There was a negative correlation found between BF% and VO₂ Max (r=-.463) and showed as non-significant (p=0.111>.05).

Variables	Mean±SD
Age (years)	16.69±1.316
BMI (kg.m ⁻²)	20.38±2.673
BF%	22.80±4.583

Table 2: Anthropometric Characteristics. Data expressed in mean and (±) Standard deviation (n=13).

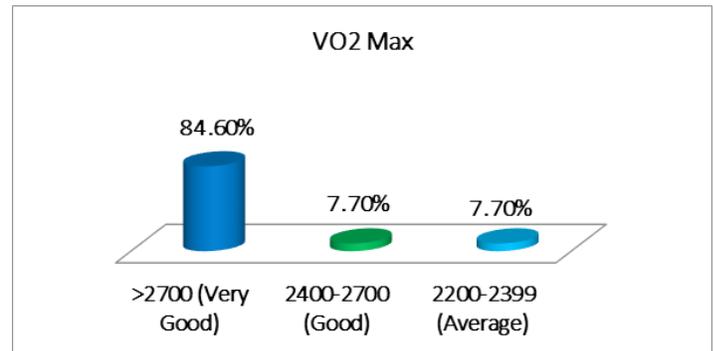


Figure 1: VO₂ Max of the participants based on Cooper test.

Variables	r	p- value
VO ₂ Max- Age	.563	.0453*
VO ₂ Max- BMI	-.643	.018*
VO ₂ Max- BF%	-.463	.111

Table 3: Correlation between Anthropometric characteristics and VO₂ Max.

Mark (*) value is representing as statistical significant (p<0.05).

Discussion

It is well established that performance in combat sports is dependent on several factors, such as anthropometric characteristics, physiological profile and nutritional requirement [13]. The principal findings of this study were very good percentages of VO₂ max present in maximum Taekwondo players. The current study found, the mean BF% was 22.80±4.583 among taekwondo players. A study by Shete, et al. (2014) [1] found 24.11±1.83 BF% among athletes. Comparing correlation between anthropometric characteristics and VO₂ Max, positive correlation was found between VO₂ Max and age indicated that increasing age tends to increase VO₂ Max and it was significant. But in contrast, Ohta, et al. (1999) [14] reported that maximal O₂ uptake was significantly decreased with age. Negative correlation between BMI and VO₂ Max was found in this study that indicated as BMI increases the VO₂ Max decreases. The Current study found a negative correlation between VO₂ max with BF%. As BF% increases as a result of decreases VO₂ max and showed as non-significant. Amani, et al. (2010) [15] stated that there was a strong relationship between the body fat percent and maximum O₂ uptakes and also indicated that increasing in body fat

percent can cause reducing VO₂ max. Previous study [16] stated that maximal O₂ uptake was significantly and negatively correlated with body fat percentage.

Conclusion

Some anthropometric factors are directly influencing the athlete's VO₂ Max. Excellent VO₂ Max shows among Taekwondo players which were concluded in this study. However, there is significant positive and negative correlation found between VO₂ Max with anthropometric characteristics such as age and BMI, which Indicated as increase VO₂ Max by increasing chronological age and a decrease VO₂ Max with increasing BMI. Conversely, there was a negative correlation between BF% and VO₂ Max and found as a non-significant. Sports trainers, nutritionist, physiotherapist, and coaches are the concern professionals who might help the players and athletes to increase their VO₂ Max.

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Conflict of Interest

We, the authors of the article declare that there is no conflict of interest regarding this article.

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