Association of VO2 Max, Agility and BMI among Collegiate Athletes

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Abstract

VO2 max is being considered as the most important determinants to measure cardiorespiratory fitness of an individual. The purpose of the present study was to determine any relationship between VO2 max and agility among collegiate athletes. A total of 100 collegiate athletes voluntarily participated in this study. The mean age (Years), height (CM) and weight (KG) of participants were 20.44, 170.37 and 61.75 respectively. The VO2 max was measured by Bruce protocol and the agility was measured by Illinois agility test. Pearson’s correlation was applied to analyze the association, and statistical insignificant result was found. The finding of present study reveals that there is no any relationship of VO2 max and agility in collegiate athletes.

INTRODUCTION

The most important determinant of athletes’ cardiorespiratory fitness is being considered as VO2 max [1]. VO2 max helps in performing moderate to high intensity exercises for prolonged period of time [2,3]. The maximum oxygen uptake (VO2 max) describes the maximal consumption of oxygen voluntarily despite increase in exercise intensity [4]. VO2 max can be determined by doing direct or indirect measurements, and the Bruce treadmill testing is one of the reliable and valid technique that can be employed for this purpose.VO2 max is also helpful in endurance activity and thus it is found to be useful in long or medium distance running, swimming, cycling, soccer etc [5].

On the other hand, agility has been defined as the ability to quickly change the direction [6-8], but not just change in the direction but in accurate manner too [9,10]. It has also defined as the sudden change in direction and movement of not just the whole body but as well as of limbs also [11,12]. Agility much helpful in activity which requires quickness and alertness and thus it found to be effective in basketball, handball, and soccer etc [13].

The relation of VO2 max with some other variables like BMI, height, weight etc has already done in numerous studies [14] and similarly the relation of agility with such other variables have also done [15], but there is paucity of work done on relation of VO2 max and agility. Furthermore, there are certain sports which require both VO2 max and agility like soccer [16], Tennis [17], etc. Therefore, the purpose of the present research work is to find the association of VO2 max and agility among collegiate athletes and this study will help the athletes, coaches and physiotherapists to improve the fitness level and performances.

METHODOLOGY

A total no. of 100 volunteer collegiate athletes of different game like, soccer, volleyball, basket ball, cricket, hockey etc. aged between 18 and 25 years were randomly selected for this study based on PAR-Q [18]. The participants were selected from various colleges/universities of Delhi-NCR, India. The participants who had participated in college/university level sports and devoid of any condition which might affect his/her performance were included in this study. A total of 250 participants were volunteered to participate in this study in which only 200 were qualified the inclusion criteria and PAR-Q and further, only 100 participants were randomly selected for this study. The age of subjects were recorded from their birth certificate which was submitted to their college. The data were collected in the morning session at room temperature. Subjects were asked to fill & return the consent form for their voluntary participation.

Measures

1. Bruce Protocol [19]: VO2 max was measured by the standard treadmill test using Bruce protocol. The subjects were asked to report 30 minutes before the test. They consumed nothing, but well hydrated, from 2 hours prior to the test. VO2 max was recorded in ml/kg/min.

2. Illinois agility test [20]: The agility was measured by the Illinois agility test. The subjects were asked to report 30 minutes before the test. They consumed nothing, but well hydrated, from 2 hours prior to the test. Agility was recorded in seconds (s).

PROCEDURE

Only 10 participants were asked to report on a prescribed
date and time in a single day. First their height and then weight were measured. The height was measured using a stadiometer to the nearest 0.1 cm during inspiration and weight was measured by digital standing scales to the nearest 0.1 kg. Then they did a warm-up session and after that their VO2 max were measured by using Bruce treadmill protocol using calibrated Casio brand. The same 10 participants were again asked to report after 5 days and then their agility were measured using Illinois agility test. Similarly, the VO2 max and agility of all participants were measured by the same protocol.

Statistical analysis

Mean, standard deviation, standard error and percentile were used to prepare summary statistics, and Karl Pearson's correlation coefficient (r) was used to determine the association between different variables. The statistical analysis was done on SPSS v16.00. A 5% confidence level was used to determine statistical significance.

RESULT & ANALYSIS

A total of 100 male individuals participated in present study with the mean age of 20.44 (±1.36) years, mean height 170.37 (±7.57) cm, mean weight 61.75 (±11.56) kg, as shown in Table (1).

Mean BMI of all individuals were 21.18 (±3.22), mean VO2 max (ml/kg/min) were 46.95 (±7.76) and mean agility of all individual(s) were 16.54 (±1.47), as shown in Table (1).

Pearson’s Correlation were applied between VO2 max, agility and BMI which was shown in Table (2).

DISCUSSION

The purpose of the present study was to determine the association between VO2 max, agility and BMI.

Statistical significant correlation (-.209) found between VO2 max and BMI, which suggested that BMI is indirectly proportional to VO2 max. A person who has lower BMI is supposed to have a greater VO2 max. The finding of this study was supported by the finding of Pribis et al, 2010 [21] & Dagan et al, 2013 [22], which worked on the association of BMI with VO2 max and suggested that an appropriate lower but within the range BMI is always essential for having a good VO2 max.

Moreover, a statistical significant correlation (203) also found between agility and BMI, which is suggestive of a significant relation between agility and BMI. It reveals that a person with good agility will have a good BMI as well. This finding was quite inconsistent with the finding of Mathisen & Pettersen, 2015 [15] who suggested that the agility performance related to anthropometrics was insignificant part from a moderate correlation in the 13 to 14 year olds. But this finding was supported by Arazi et al. (2016) [23], who suggested that body mass index and agility were significantly related to success and had more importance for taekwondo athletes.

Statistical insignificant correlation (-.195) were observed between VO2max and agility. It means that VO2 max has to do nothing with the agility or vice versa. Therefore, in order to improve agility one has to do agility exercises only, and to improve VO2 max, one should do endurance exercises. Therefore, if we think that by doing only one type of exercise will improve both VO2 max and agility, it may not possible. The finding of the present study was in contrast with the findings of Arazi et al. (2016) [23], who suggested that that aerobic power and agility were significantly related and had importance in taekwondo athletes.

CONCLUSION

The finding of the present study reveals that a person’s maximum oxygen consumption or VO2 max is extensively dependent upon his/her BMI. An adequate and minimum BMI is essential for having higher VO2 max. Therefore, in order to increase VO2 max one should have to decrease their weight to minimize BMI and hence improve VO2 max.

This finding can help athletes, coaches, Physiotherapists and Team managers to acquainted with the need of maintaining athletes’ body weight thereby to maintain BMI and ultimately to improve VO2 max.

The BMI also plays important role in a person’s agility. Therefore, in order to improve and maintain the agility one has to control their BMI and vice versa.

Moreover, the finding of this present study also reveals that there is no relationship between VO2 max and agility. So, there is no any single method to improve VO2 max and agility both, as both are in dependent variables. So, the athletes, coaches, trainers, physiotherapists etc should keep this thing in their mind if they want to improve VO2 max then they should plan some endurance exercises and to improve agility they should plan some agility exercises separately.

In a nutshell, we can conclude that BMI has an impact on person’s VO2 max as well as on agility, but agility and VO2 max are not associated with each other.

REFERENCES


