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Original Research Article

Association of Abdominal Endurance with Body Mass Index and Playing Hours in Collegiate Cricket Players: An Observational Study

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ABSTRACT

Objective: To find the association between abdominal endurance, Body Mass Index and playing hours in collegiate cricket players.

Study design: Observational study.

Settings: Uka Tarsadia University, Bardoli, Gujarat, India.

Participants: 101 collegiate male cricket players with ages ranging from 18-24 years.

Outcome measures: The abdominal endurance of all the players were assessed using the American College of Sports Medicine (ACSM) Curl-up test. Body mass index (BMI) and the number of playing hours per week were recorded as the other outcome measures.

Results: The players exhibited excellent abdominal endurance. Pearson coefficient correlation test was used to assess the association of abdominal endurance with BMI and playing hours. The results showed that there was no association between abdominal endurance with BMI. However, there was a significant correlation found between abdominal endurance and plying hours in collegiate cricket players.

Conclusion: It is concluded from the present study that abdominal endurance is associated with plying hours. Hence, for enhancing abdominal endurance one should consider increasing the playing hours, so as to improve overall performance. Also, the results showed that abdominal endurance is independent of BMI.

KEY WORDS: Abdominal Endurance, Body Mass Index, Cricket, Sports Medicine, Crurl-Up Test.

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INTRODUCTION

Cricket is the most popular sport in common-wealth countries and one of the most famous sports in the world. It has emerged into the highly organized activity of Indian society and it has ended up as a complex social and cultural phenomenon [1]. In the game of Cricket, physical capabilities should be noted highly in the manner of fitness as the cricket is an intermittent sport where fitness mantra should be followed to become a fit cricketer. Cricket is a unique sport in which, there are number of different formats like Test format, One day internationals, T-20 internationals. In early years, cricket was not assumed or focused as a sport of fitness, but just a play of bat and

ball so the type and body built of players were neglected and not considered. As the introduction of T-20 cricket and One day internationals match, the game has gone through major changes and physical demands made on cricketer's body have also increased dramatically [2].

It is played with three skills; batting, fielding, and bowling, which require excellent focus, postural control, strength, muscular endurance, explosive bursts, and fitness [3].

Physical variables are the most essential contributing factors for better overall performance in all sports activities and games as in cricket. The game of cricket requires a significant amount of physical fitness and mastery of skills. A cricket player must possess precise speed, strength, power, agility, flexibility, and endurance in abundance so as to learn and master the strategies of the game [4].

Core stability is described as the body's ability to control the position of the trunk and pelvis for optimum production; transfer and control of functional activities. Many sporting activities including bowling require complex coordination between the upper and lower extremities. The core functions as the significant link between the upper and lower extremities [5]. The core vicinity of the body has been anatomically defined as a box, with the abdominals on the front, spinal and gluteal muscle groups at the back, the diaphragm at the top, and the pelvic floor and hip muscles at the bottom. Abdominal

muscles consist of four primary muscles, the rectus abdominis, external oblique, internal oblique, and transverses abdominis. Abdominal muscle endurance and strength are one of the predominant foundations for maintaining pristine through a long duration of work [6].

Anthropometric parameters are a set of non-invasive, quantitative approaches for determining human size, shape, proportion, and composition by measuring, recording, and analyzing specific measurements of the body. Anthropometry has a rich custom in sports sciences and sports medicine [7].

In current years sports scientists consciously used diverse anthropometric tests which include Sagittal belly diameter (SAD), body mass index (BMI), and waist to hip ratio (WHR) to measure athlete's abdominal characteristics. On the other hand, body mass index is a very beneficial index to understand the individual's fatness. The specific anthropometric and fitness characteristics inclusive of stature, body mass, physical strengths, dash sprint, and jumping are related to the good overall performance of players [8]. However, a review of the current literature suggests that Sit-ups and Push-Ups tests may be associated not just with local muscular strength and endurance per se.

A number of different factors might be known to be associated with health and health may account for how well one performs on the testing batteries. For instance, according to more recent research, body mass index (BMI), regional fat distribution, and skinfold thicknesses may additionally explain, to a meaningful degree, one's overall performance on these sorts of fitness assessments[8].

However, the association between endurance, particularly abdominal endurance, playing hours and BMI still require extra investigation. Thus, it has been hypothesized that abdominal endurance, playing hours and BMI could probably be associated with each other. Hence, the purpose of the study is to investigate the association between abdominal endurance, playing hours and BMI in collegiate cricket players. These findings might be beneficial for coaches and trainers of younger athletes, since they may assist in designing the training regimen.

The research questions are:

1. What is the association between Abdominal endurance and Body Mass Index in collegiate cricket players?

2. What is the association between Abdominal endurance and the number of playing hours in collegiate cricket players?

METHOD

Design: A prospective observational study was conducted.

Participants: 101 collegiate male cricket

players were included in the study, their ages ranged from 18 to 24 years old. Informed consent was obtained from all the players before participating in the study. The players who participated in inter-college or inter-university cricket championships took part in the present study. The players are excluded if presented with any of the following conditions or impairments: any musculoskeletal condition, any clinically known cardiovascular condition, any neurological deficit, any congenital deformities or any recent surgeries

Outcome measures: Primary outcome: ACSM Curl-up test was the primary outcome measure that assessed the abdominal endurance of all the players. It is performed with the player lying on his back on a mat with knees bent at a 90°angle and feet on the floor. The arms rest at the side with fingers touching the piece of masking tape. The second piece of tape is placed 20 cm beyond the first piece. The test was performed on a metronome set at 40 beats per minute. At the first beep, the player lifts his shoulder blades off the mat by flexing the spine until the fingertips reach the second piece of tape. At the next beep, the player slowly returns the shoulder blades to the mat by flattening the lower back. The players performed as many curl-ups as possible without stopping, up to a maximum of 75 repetitions [10]. The number of curl-ups performed by the players was recorded.

Secondary outcome: Body Mass Index (BMI) was calculated as the weight (in kilograms) divided by the height (in meters) squared [11]. The number of hours per week during which players practiced cricket was also recorded as another outcome measure.

Data analysis:

All the statistical analysis was carried out using SPSS 22.0 software. Data were assessed for normal distribution with the help of the Shapiro-Wilk test. For assessing the correlation between abdominal endurance, BMI and the number of playing hours per week, the Pearson correlation coefficient test was used. Any value <0.05 was considered significant and any value <0.001 was considered highly significant.

RESULTS

Flow of participants through the study: 101 collegiate male cricket players who fulfilled all the inclusion criteria were assessed. BMI and the number of playing hours per week were noted. All the players performed the ACSM Curl-up test; the number of repetitions performed by each player was recorded. Characteristics of all the players in terms of Mean (SD) are listed in Table 1.

Table 1: Characteristics of all the players

Demographic Data	Mean (SD)
Age	20.42 (1.64) years
BMI	21.36 (2.15) kg/m^2
Playing Hours	3.29 (0.62) hours
ACSM Curl-up test	30.97 (11.23)

***Data are Mean (SD)** (95% Confidence Intervals) n= 101

Is there an association between Abdominal endurance and Body Mass Index in collegiate cricket players?

The average abdominal endurance of the players was found to be 30.97(11.23), which suggests that the players exhibited excellent abdominal endurance [12]. The mean (SD) BMI of all the players is 21.36(2.14), hence the players had BMI within the normal range [11]. The present study aimed to find the association between Abdominal endurance and BMI, and we found that there was no significant association between abdominal endurance and BMI, as presented in Table 2.

Table 2: Pearson correlation coefficients of abdominal endurance with BMI and playing hours.

	ACSM Curl-up test	BMI	Plying Hours
ACSM Curl-up test	1	047 (p=0.639)	.218* (p=0.28)
BMI		1	-0.013 (p=0.900)
Plying Hours			1

*. Correlation is significant at the 0.05 level (2-tailed).

Is there an association between Abdominal endurance and the number of playing hours in collegiate cricket players?

The collegiate cricket players had 3.29(0.62) as the mean (SD) of playing hours per week. A significant positive correlation was found

between abdominal endurance and playing hours, (p=0.28). This can be interpreted as the players who used to play more cricket had excellent abdominal endurance.

DISCUSSION

The objective of the present study was to find the association between abdominal endurance, BMI, and the number of playing hours. We hypothesized that there may be some kind of relationship between abdominal endurance, BMI and playing hours. The hypothesis is partially accepted since the result of the study revealed a positive significant correlation between abdominal endurance and the number of playing hours. However, there was no association between abdominal endurance and BMI. These results came in conformity with that of the previous study concluded by Motka and Shah [14], who evaluated abdominal muscle strength in individuals between ages 18-25 years and mentioned that no significant correlation was observed between BMI and abdominal muscles strength: Transversus abdominis, Upper and lower abdominal muscles. Noha Abdel Kader Hasan, et al [13] also did a similar study that aimed to find out the relation between body mass index percentile and muscle strength and endurance. The correlation coefficients of their study revealed a negative correlation between BMI percentile and endurance time of abdominal muscles. While these outcomes contradicted a study conducted by Muhammad Shahidul Islam [6], who reported that there was a moderate level relationship between Abdominal Endurance and the selected independent variable-Body Mass Index.

The results of our study also revealed that the players exhibited excellent abdominal endurance and also their BMI is within the normal range. This is explained by Motka and Shah [14] who mentioned that obese children had poorer abdominal muscles strength as they displayed a protruding abdomen which results in anterior displacement of the center of gravity, which is associated with an increase in lumbar lordosis and anteversion of pelvis, continual exaggeration of curves leads to impairment in posture and muscle strength of abdomen and hip. Thus, individuals with normal BMI are thought not to have protruding abdomen which makes it easier for them to perform the curl-ups.

There were a few limitations of the present study. Firstly, only one anthropometric measure i.e.; BMI was assessed. Thus, future studies can be done with other anthropometric measures. Secondly, we have not categorized the players into bowlers, batters and fielders. This might have affected our findings.

CONCLUSION

In, conclusion the study suggests that Abdominal muscle endurance is independent of BMI. Therefore, conditioning directed at improving anthropometric measures would not be worthwhile and appropriate and would need a more comprehensive conditioning program. However, abdominal endurance is associated with plying hours. Hence, for enhancing abdominal endurance one should consider increasing the playing hours, so as to improve the overall performance.

Conflicts of interest: **None**

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