Phys. Educ. Sport Stud. Res. 2(1); 44-58 (2023)
DOI: 10.56003/pessr.v2i1.179

Physical Education and Sport: Studies and Research

ORIGINAL RESEARCH Open Access

A Study on the Impact of Various Motor Fitness Characteristics on Performing Ability in High and Low-Performing Divisional Women Cricket Players

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Submitted : January 9, 2023
Accepted : April 4, 2023
Published : April 26, 2023

Abstract

Background: Motor fitness has a big impact on the cricket performance pyramid.
Objectives: The research concentrates on certain motor fitness components to improve playing competency in both high- and low-performing Divisional women cricket players.
Methods: For this study, 36 female players were randomly selected as subjects from the Bangladesh Women's National Cricket League held in Sylhet in 2022-23. They ranged in age from 16 to 27 years. Three equal groups of twelve people each were formed from the chosen subjects. Khulna, Sylhet, and Dhaka teams were represented by Group I, Group II, and Group III, respectively. Regular exercises and training were provided to enhance the player's performance in the game. Our research scholar additionally prepared the questionnaires with the help of the literature review. The researcher reported the following motor fitness factors: explosive leg power, speed, agility, and cardiovascular endurance. The generated data were gathered during the competition and statistically evaluated after the competition by applying ANOVA and Post Hoc Test (Tukey HSD). The researcher used the statistical software package SPSS version 26 for data analysis.
Results: The results of the study showed that there were significant differences in motor fitness characteristics between high and low-performing Divisional women cricket players. High-performing players had significantly better scores on cardiovascular endurance (p=.000), explosive leg power (p=.013), speed (p=.002), and agility (p=.000) than low-performing players. The Champion Team (Sylhet) of the league was discovered to be more successful than other teams in achieving high-level performance.
Conclusion The study concluded that to execute the best gaming plan, playing skill exclusively depends on physical condition and a stress-free mind. The study highlights the importance of motor fitness characteristics in cricket performance. The findings may have implications for developing training programs tailored to improve specific motor fitness characteristics for players at different performance levels.

Keywords: cardiovascular endurance, agility, speed, explosive leg power, female cricket players.

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INTRODUCTION

Over the past few decades, there has been a tremendous increase in research on the cognitive advantages of physical activity (PA) and fitness (Marchetti et al., 2015a). As a result, authoritative organizations and institutions that advocate for PA to improve health are beginning to include the practical significance of the exercise-cognition interaction in their official statements and recommendations (Garber et al., 2011). Training is a crucial component in getting ready for sporting events. In order to be considered fit for sports, a player must be able to achieve these requirements; otherwise, they risk being unable to handle the physical stress of practice and competition. In this scenario, the player must become more physically fit to avoid getting rejected (Reilly, 2005). Regular training that includes exercises aimed at improving motor fitness can lead to significant improvements in physical performance, enhancing an individual's ability to perform daily activities and participate in sports and other physical activities (Sarkar & Kandar, 2022). Different types of fitness training and conditioning have a positive impact on motor fitness by improving strength, endurance, balance, coordination, and flexibility. This can lead to improved performance in physical activities and a reduced risk of injury (Majhi et al., 2016). According to sports principles and application, the majority of sporting accomplishments are primarily determined by the quality of one's motor skills (Singh, 2018). A person's ability to push, leap, strike, etc. with sufficient force depends on their muscular power, also known as explosive energy, which is a combination of speed and strength (Laursen, 2010). There are several ways to boost power, including boosting physical prowess without sacrificing speed, boosting movement speed without compromising strength, and boosting both by exerting powerful force while moving quickly (Singh et al., 2017).

The impact of various motor fitness characteristics on performing ability in high and low-performing cricket players can be significant. Motor fitness characteristics refer to the physical abilities that are necessary for effective and efficient movement. These characteristics include strength, power, speed, agility, balance, and coordination. Like in many other sports, motor fitness plays a significant role in the cricket performance pyramid. With an increase in performance level, motor fitness also rises (Bhalse & Reddy, 2018). In cricket, players need to perform a variety of skills, such as throwing, catching, running, batting, and bowling. Each of these skills requires specific motor

fitness characteristics, and the ability to perform them at a high level can greatly impact a player's overall performance (Das & Mitra, 2016). The most popular spectator sport worldwide, behind association football, is cricket, which is also the most popular sport in Bangladesh. It is the only sport that has been zealously protected by everyone who plays or watches it, and it is characterized by short sprints, quick acceleration or deceleration, turning, strength, power, balance, and other attributes (Chanda et al., 2018).

In cricket, fitness hasn't always been valued as highly as it is in other sports. It's impossible to exaggerate the importance of fitness in any activity (Bartlett, 2003). Your performance will improve if you are physically fit. Cricket, however, is a sport that also puts your physical stamina, mental tenacity, and gaming abilities to the test (Mandrekar, 2017). Motor fitness has a significant influence on all facets of the game of cricket, but it is particularly important for attacking fielding, fast bowling, including over-arm throws, running between wickets, and hitting. Performance evaluations of motor fitness are based on a combination of several parameters (Kumar et al., 2019). Sports like cricket are believed to need a team to engage in physical tasks including motor skills, jumping, bending, stretching, and throwing velocity (Boby & Badhan, 2023). Measuring one's level of fitness complements developing one's technical competence, tactical awareness, and mental agility, all of which are crucial for performance in cricket and are beneficial for assessing and keeping track of cricket players (Noakes & Durandt, 2000).

There is limited research available on the impact of motor fitness characteristics on the performance of female cricket players, especially in the context of divisional level cricket. While some studies have explored the relationship between physical fitness and cricket performance, they have mainly focused on male players or at the international level (Brock et al., 1941; Kumar et al., 2019; Lamani & Tiwari, 2018; Marchetti et al., 2015b; Sandhu & Barinderpal Singh, 2017; Sholto-Douglas et al., 2020; Singh & Singh, 2017; Smita Wagh et al., 2022). Thus, this study aims to fill this research gap by investigating the impact of various motor fitness characteristics, including speed, agility, explosive leg power, and cardiovascular endurance on the performance of both high and low-performing divisional women cricket players. This study could help coaches and trainers develop more effective training programs that target specific motor fitness characteristics to improve the performance of female cricket players, especially those at the divisional level. By conducting a detailed analysis of the motor fitness characteristics

and their relationship with cricket performance, this study can provide valuable insights into the training needs of female cricket players and help to enhance their overall performance. Additionally, it can contribute to the development of women's cricket in general, which has seen increased attention and investment in recent years.

METHOD

Participants

The aim of the research was to compare the players from the Bangladesh Women's National Cricket League's teams from Khulna, Sylhet, and Dhaka to see if there were any considerable differences in their performance capabilities and motor fitness characteristics. For the study, a total of 36 female cricket players, whose ages varied from 16 to 27, were randomly chosen as subjects from the Bangladesh Women's National Cricket League, which was played in Sylhet in 2022–2023. Three equal groups of twelve subjects each were formed from the chosen subjects. Khulna, Sylhet, and Dhaka teams were represented by Group I, Group II, and Group III, respectively.

Selection of Variables

After discussing with experts, the viability of the criteria, the accessibility of tools, and the variables' applicability to the current study, the variables were chosen. The researcher selected the following variables for this study (Table 1).

Table 1. Variables and Instrument

No	Variables	Methods	Tools	Measures
1	Cardio-vascular Endurance	Cooper's 12 Minutes Run	Flat oval 400m running track, marker cones, recording sheets, and digital stopwatch.	Second
2	Speed	50 Yard Dash	An area having a starting and finishing line on a track, football field, or playground. A score sheet, two stopwatches, or a split-second timer.	Second
3	Agility	Shuttle Run	Field, Measuring Tape, Digital Stopwatch, Measuring Tape, Whistle and 4-6 piece Wooden Blocks etc.	Second
4	Explosive Power	Standing Broad Jump	Recommended non-slip surface for takeoff, soft landing area, and measuring steel tape to measure distance jumped.	Centimeter

Procedure of Data Collection

The initial stage in the data-collecting procedure for the study was to contact the managers and coaches of the three divisional cricket teams that were included in the sample frame. As a result, letters were sent to coaches asking for their consent to give the athletes the questionnaire and assessments. The estimated dates of the visits to the locations were sent to the coaches after receiving confirmation of their approval. The concerned head produces the authorization letter. After explaining the goal of the research and assuring the players that the information acquired from them would be kept confidential, the investigator started delivering the questionnaire to the participants. With the use of this introduction, the investigator was able to convince the respondents to provide accurate information about the household's income. The investigator distributed the questionnaire in the field and the hotel room, went through each item with the participants, and then had them complete it. When the players had any doubts, the investigator answered them. The investigator and her assistant collected the questionnaire once it had been filled out completely. The researcher began gathering information from the teams. Every attempt was made in the present survey to minimize non-sampling errors as much as feasible. The aim of the research was described, and the respondents felt confident enough to provide accurate information about their family's financial situation when asked if it was required.

Data Analysis

The generated data were gathered both prior to and following the competition and statistically evaluated by applying ANOVA and Post Hoc Test (Tukey HSD). For the purposes of this investigation, the level of significance was chosen at 0.05, which was considered acceptable. The researcher used the statistical software package SPSS version 26 for data analysis.

RESULTS

To determine the significance of mean values among three groups the F' test was used to analyze variance. Here, Table 2 shows the mean and SD values of cardiovascular endurance test of three groups namely Sylhet Division, Khulna Division and Dhaka Division were 2657.17±127.5, 2454.17±133.1 and 2318.33±91.9 respectively. The table shows the calculated F ratio of Sylhet group, Khulna Group and Dhaka Group on

cardiovascular endurance test was 24.678 which was significant at 0.05 level of confidence.

Table 2. Analysis of covariance of cardiovascular endurance values between Khulna, Sylhet, and Dhaka women's cricket team.

No	Team	Mean and SD	df		F value	p value	Remarks
01	Sylhet Division	2657.17±127.5	Between groups	2			
02	Khulna Division	2454.17±133.1	Within groups	33	24.678	0.000	Significant at 0.05 level
03	Dhaka Division	2318.33±91.9	Total	35			

Significance at 0.05 level of confidence

Here Table 3 shows adjusted mean difference of Sylhet – Khulna group (203*), Sylhet – Dhaka group (338.84*) and Khulna – Dhaka group (135.84*) which were Significant as compared to Tukey HSD score 119.79. As mean difference is greater than Tukey HSD score so, there is significant difference between Sylhet – Khulna, Sylhet – Dhaka and Khulna – Dhaka group on cardiovascular endurance.

Table 3. Post Hoc Test (Tukey HSD)

Team	Mean Difference	Tukey HSD
Sylhet - Khulna	203*	
Sylhet - Dhaka	338.84*	119.79
Khulna - Dhaka	135.84*	

* Significant as compared to HSD

Here, Table 4 shows the mean and SD values of agility test of three groups namely Sylhet Division, Khulna Division and Dhaka Division were 10.35±.49, 11.13±.65 and 11.55±.59 respectively. The table shows calculated F ratio of Sylhet group, Khulna Group and Dhaka Group on cardiovascular endurance test was 11.564 which was significant at 0.05 level of confidence.

Table 4. Analysis of covariance of agility between Khulna, Sylhet, and Dhaka women's cricket team.

SL	Team	Mean and SD	df		F value	p value	Remarks
01	Sylhet Division	10.35±.49	Between groups	2			
02	Khulna Division	11.13±.65	Within groups	33	11.564	0.000	Significant at 0.05 level
03	Dhaka Division	11.85±.59	Total	35			

Here Table 5 shows adjusted mean difference of Sylhet – Khulna group (.78*), Sylhet – Dhaka group (1.5*) and Khulna – Dhaka group (.72*) which were Significant as compared to Tukey HSD score .638. As the mean difference is greater than Tukey HSD

score so, there is significant difference between Sylhet – Khulna, Sylhet – Dhaka and Khulna – Dhaka group on agility.

Table 5. Post Hoc Test (Tukey HSD)

Team	Mean Difference	Tukey HSD
Sylhet - Khulna	.78*	
Sylhet - Dhaka	1.5*	.638
Khulna - Dhaka	.72*	

* Significant as compared to HSD

Here, Table 6 shows the mean and SD values of agility test of three groups namely Sylhet Division, Khulna Division and Dhaka Division were 49.52±1.46, 48.63±.94 and 47.86±1.40 respectively. The table shows the calculated F ratio of Sylhet group, Khulna Group and Dhaka Group on leg explosive power test was 4.993 which was significant at 0.05 level of confidence.

Table 6. Analysis of covariance of leg explosive power between Khulna, Sylhet, and Dhaka women's cricket team.

SL	Team	Mean and SD	df		F value	p value	Remarks
01	Sylhet Division	49.52±1.46	Between groups	2			
02	Khulna Division	48.63±.94	Within groups	33	4.993	0.013	Significant at 0.05 level
03	Dhaka Division	47.86±1.40	Total	35			

Here Table 7 shows adjusted mean difference of Sylhet – Khulna group (.89), Sylhet – Dhaka group (1.66*) and Khulna – Dhaka group (.77). As mean difference of Sylhet and Dhaka group is greater than Tukey HSD score 1.29 so, there is significant difference between Sylhet – Dhaka group on leg explosive power. But there was no significant difference between Sylhet – Khulna group and Khulna – Dhaka group.

Table 7. Post Hoc Test (Tukey HSD)

Team	Mean Difference	Tukey HSD
Sylhet - Khulna	.89	
Sylhet - Dhaka	1.66*	1.29
Khulna - Dhaka	.77	

* Significant as compared to HSD

Here, Table 8 shows the mean and SD values of speed test of three groups namely Sylhet Division, Khulna Division and Dhaka Division were 7.26±.34, 7.64±.31 and 7.74±.30 respectively. The table shows calculated F ratio of Sylhet group, Khulna Group and Dhaka Group on speed test was 7.653 which was significant at 0.05 level of confidence.

Table 8. Analysis of covariance of speed values between Khulna, Sylhet, and Dhaka women's cricket team.

SL	Team	Mean and SD	df		F value	p value	Remarks
01	Sylhet Division	7.26±.34	Between groups	2			
02	Khulna Division	7.64±.31	Within groups	33	7.653	0.002	Significant at 0.05 level
03	Dhaka Division	7.74±.30	Total	35			

Here Table 9 shows adjusted mean difference of Sylhet – Khulna group (.38*), Sylhet – Dhaka group (.48*) and Khulna – Dhaka group (1.1*) which were Significant as compared to Tukey HSD score .029. As mean difference is greater than Tukey HSD score so, there is significant difference between Sylhet – Khulna, Sylhet – Dhaka and Khulna – Dhaka group on speed.

Table 9. Post Hoc Test (Tukey HSD)

Team	Mean Difference	Tukey HSD
Sylhet - Khulna	.38*	
Sylhet - Dhaka	.48*	.029
Khulna - Dhaka	1.1*	

* Significant as compared to HSD

DISCUSSION

Table 2 demonstrated a substantial difference in cardiovascular endurance amongst the players of the Khulna, Sylhet, and Dhaka women's cricket teams. The Sylhet Team was discovered to be more successful than other teams in achieving high-level performance. The team members received adequate training, and better performance was observed by the Sylhet team. Endurance is the ability of the cardiovascular and respiratory systems to supply oxygen to working muscles during physical activity. A higher level of cardiovascular endurance allows athletes to perform for longer periods without fatigue, which can be particularly important in sports that require sustained effort, such as cricket (Vickery et al., 2014). In high-performing cricket players, a higher level of cardiovascular endurance can provide a competitive advantage, allowing them to maintain their performance level over extended periods of play. This can be especially important in longer games or tournaments, where endurance can become a determining factor in the outcome of the game (Gamble, 2013). Higher cardiovascular endurance can also help players recover more quickly between matches, reducing the risk of injury and allowing them to perform at their best throughout a tournament. In low-performing women cricket players, a lack of cardiovascular

endurance can limit their ability to perform at a high level for extended periods of time. This can result in fatigue, reduced performance, and an increased risk of injury. Improving cardiovascular endurance through training can help low-performing players increase their stamina, enabling them to perform for longer periods without experiencing fatigue. Table 4 illustrated the significant agility differences between the Sylhet squad and the Khulna and Dhaka teams. Agility preserves the player's capacity for competitive rivalry (Bhalse & Reddy, 2018). Agility is a crucial factor in cricket performance, especially for fielding and batting. It is the ability to quickly change direction and accelerate/decelerate in response to various stimuli (Noakes & Durandt, 2000). The impact of agility on performing ability in high and low-performing women cricket players can vary based on several factors.

Research suggests that agility training can improve cricket performance in both high and low-performing women cricket players. High-performing players tend to have better agility compared to low-performing players, but this difference can be minimized with training (Foster et al., 1996). High-performing players can benefit from agility training by improving their speed, acceleration, and deceleration, which can give them an edge in the game (Carr et al., 2017). However, the impact of agility on performing ability can also depend on other factors, such as physical fitness, technical skills, and psychological factors. Players who are physically fit and have good technical skills may be able to perform better than those who lack these qualities, even if they have similar levels of agility (Herridge et al., 2020).

Table 6 demonstrates significant changes in explosive leg power in all the team players. The exposure and training led to a better outcome for the Sylhet team when exhibiting explosive power. In high-performing women cricket players, explosive leg power is likely to have a greater impact on their performance compared to low-performing players. This is because high-performing players require greater power to perform at a higher level, and explosive leg power can provide a competitive edge in activities such as running between wickets, fielding, and hitting boundaries (Smita Wagh et al., 2022). Table 8 results demonstrate that there were substantial differences in the speed metrics in the Sylhet team when compared to the Khulna and Dhaka team. This was caused by their socioeconomic standing, psychiatric issues, and intensive training that improved their performance at the national level. The impact of speed on performing

ability in high and low-performing women cricket players is likely to vary depending on several factors. In general, speed is an important attribute for cricket players, especially in terms of batting and bowling. However, the specific impact of speed on performance will depend on the individual player's skills, strengths, and weaknesses (Lamani & Tiwari, 2018). For high-performing cricket players, speed can be a key factor in maintaining their level of performance. These players may have developed their skills and techniques to a high level, and their ability to execute these skills quickly and accurately can be a significant advantage (Lockie et al., 2013). For example, a fast bowler with good accuracy and the ability to vary their pace can be a formidable opponent for any batting team, regardless of their level of performance (Portus et al., 2000). On the other hand, for low-performing women cricket players, speed may not be as critical a factor in improving their performance. These players may need to focus more on developing their overall skills and techniques, rather than relying solely on speed. While speed can certainly help these players improve their performance, it may not be the most important factor in their overall success.

In the Bangladesh Women's National Cricket League, Sylhet was champion and Dhaka was runner-up. The study's findings demonstrated that player's motor fitness played a vital role in the Bangladesh Women's National Cricket League. In the current study, the players from the Sylhet squad outperformed the Khulna and Dhaka teams in terms of physical fitness, agility, speed, and cardiac endurance. Having good physical health will improve performance. Like many other sports, cricket performance is greatly influenced by motor fitness. Motor fitness increases along with performance level (Herridge et al., 2020). In this study, the investigator looked at selected motor fitness variables like cardiovascular endurance, speed, agility, and explosive power for categorized highly talented players from various teams competing in the Bangladesh Women's National Cricket League 2022-23 in Sylhet. It was discovered that the Sylhet Team had better cardiovascular endurance than the other team members. Their efficient instruction, encouraging setting, greater exposure to active learning, and playing prowess are the reasons behind this. Cricket players' medium of performance is supported by elements of their motor fitness, and personal behaviors, and socioeconomic standing (Begum, 2015). When faced with cues linked to sports during reactive agility tests, greater athletes who compete in omnidirectional (agility) sports had better decision-making

abilities (Farrow et al., 2005). The player's speed and agility support their capacity to perform well in their game (Callaghan et al., 2015). According to the study's findings, Sylhet's players demonstrated their quickness and speed while making game-changing decisions, and their agility decreased at this level as a result when they placed a greater emphasis on their performance and shrewdness. A favorable correlation between socioeconomic level and speed-agility performance was also shown by Freitas (Freitas et al., 2007). They also discovered that compared to females from lower socioeconomic backgrounds, girls from medium socioeconomic background had topmost physical prowess. Contrarily, our research found that socioeconomic level was positively correlated with cardiovascular stamina, agility, and explosive strength. As a result, there is a positive correlation in our study, indicating that increased exposure, a strong socioeconomic level, and physical fitness enhance advancement in the area of play and demonstrate the Sylhet team members' brilliance in performance, understanding, performing capability and talents. Additionally, it boosts the self-confidence of the athletes and keeps their thoughts relaxed, refreshed, and concentrated.

CONCLUSION

In this study, the results reveal that motor fitness variables i.e. cardiovascular endurance, speed, agility, and explosive leg power plays a vital role on players performance from various teams competing in the Bangladesh Women's National Cricket League 2022-23 in Sylhet. It was discovered that the Sylhet Team (champion team) has performed better in cardiovascular endurance, speed, agility, and explosive leg power than the other team members. High-performing women cricket players, have a significant motor fitness than low-performing cricket players that impact on their ability to perform at their best. In contrast, the impact of motor fitness on low-performing women cricket players is less significant. This is because low-performing players do not have a high level of physical fitness in order to compete at the elite level as compared to Sylhet team.

We believe that our study may contribute to safer and more effective training for young female cricket players by enabling us to pinpoint the core motor skills that are largely responsible for the successful execution of situational motor abilities. Thus, we will offer suggestions that, in our opinion, might improve the training procedure.

1. Exercises with an acyclic structure should be included in the training regimen since they significantly advance the cognitive skills particularly perceptual skills

that are so important for developing young female cricket players. The best growth of a young female cricketer includes sports aerobics, leg workouts, and general movement skill.

2. Although agility is regarded as a crucial component for athletic success, it is nevertheless one of the least studied aspects of sports performance. Any sport requires fundamental movement patterns for successful participation. Better movement technique enables an athlete to get more out of the training regimen and perform better in competition.
3. Researchers also believe that the development of fundamental motor skills must go hand in hand with greater technological preparation.
4. This study revealed the skills that had the biggest impact on increasing motor ability test scores. With this knowledge, one may choose the training assessment that would be most appropriate for dealing with young female cricket players. Finally, we must recognize that exceptional performance can only be achieved when athlete training and competition are founded on scientific trends. This is likely the only proper approach to directing our league competition toward modern cricket game advancements. In conclusion, it is also likely to be said that cricketers made the most improvement because of efficient training methods to increase motor fitness.

ACKNOWLEDGMENTS

The author would like to express special thanks to Shohaly Akther for her time and efforts she provided throughout the year. Your useful advice and suggestions were helpful to me during the data collection. The author would like to acknowledge that this article was completed entirely by the author and not by someone else.

CONFLICT OF INTEREST

The author hereby declares that this research is free from conflicts of interest with any party.

AUTHOR'S CONTRIBUTION

The author's contributions include preparing concepts, formulating methods, conducting research, processing results, interpretations, and conclusions, editing the final version.

FUNDING/SPONSORSHIP

This research does not receive external funding.

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