




Assessing aerobic endurance in elite female cricket players: A comparative study of Bangladeshi and Indian athletes

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ABSTRACT

To assess and compare the aerobic endurance levels of elite female cricket players from Bangladesh and India. This study's participants were 50 elite female cricket players (ages 18-30 years), with 25 players from each country. They were all considered elite players based on their performance and experience in national and international cricket tournaments. To measure aerobic endurance fitness, the participants underwent a Yo-Yo Intermittent Recovery Test Level 1 (YYIRT1), which is widely used to measure an individual's maximal oxygen uptake (VO_{2max}) and aerobic capacity. The data collected were analysed using descriptive statistics and inferential statistics. The test of Normality, mean, and standard deviation were calculated for each group, and a t-test was used to compare the mean scores of the two groups. A p-value of less than .05 is considered statistically significant. The data were analysed using the statistical software SPSS version 26. The study found that the Indian female cricket players had a significantly higher aerobic endurance fitness level than the Bangladeshi players. The mean VO_{2max} of the Indian players was 46.76 ml/kg/min, while the Bangladeshi players' mean VO_{2max} was 43.60 ml/kg/min. Additionally, the Indian players had a higher mean score in total distance covered in YYIRT1 (1233.6 m) than the Bangladeshi players (857.6). These differences were found to be statistically significant ($p < .05$). These findings suggest that there may be a difference in the training and preparation methods between the two countries, leading to a higher aerobic endurance fitness level among Indian players.

Keywords: Performance analysis of sport, Aerobic endurance fitness, Female cricket players, Elite athletes, Fitness field test, YYIRT1.

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INTRODUCTION

Physical fitness refers to a group of physical qualities that allow the body to respond to and adjust to the demands and stress of physical exercise (Wuest & Bucher, 1995). A player's level of fitness determines how much speed, endurance, strength, and physical strain he can withstand (Barth et al., 2007). A player's ability to engage in a game without being overly exhausted, as well as their capability to leap far and high, run swiftly in all directions, change directions quickly, and completely stretch their joints, are examples of physical fitness in sports (Haskell et al., 2007). Physical fitness qualities are the most important factors contributing to successful performance (Marques et al., 2009). Cricket is an intermittent game, with intervals of high-intensity movements like bowling and batting interspersed with extended stretches of low-intensity activity (Jeffreys & Moody, 2021; Noakes & Durandt, 2000; Sholto-Douglas et al., 2020; Stretch et al., 2000). Physical fitness is crucial in all forms of cricket, but the demands on players can vary depending on the format of the game. Like test cricketers need to have a high level of aerobic fitness, as they may need to bat or bowl for extended periods of time. Likewise, the ODI format emphasizes explosive power and speed, as players need to score runs quickly and take wickets at regular intervals. Players need to have good anaerobic fitness, as they may need to sprint and perform explosive movements, such as diving and throwing, throughout the match (C. Petersen et al., 2009; C. J. Petersen et al., 2010, 2011; Sholto-Douglas et al., 2020). In contrast to T20 format cricket, T20 cricket is the shortest format of the game, lasting just 20 overs per side. This format requires players to have exceptional explosive power and agility, as they need to score runs quickly and field effectively. Players need to have good anaerobic fitness, as they may need to sprint, dive, and change direction frequently throughout the match (C. J. Petersen et al., 2010). The performance of physically fit cricket players has been found to be better, more reliable, and less injury-prone (Smita Wagh et al., 2022). Aerobic endurance fitness is critical for cricket players as it helps them maintain their energy levels throughout a game that can last for several hours (Raja, 2019). Cricket involves a combination of short bursts of high-intensity activity, such as sprinting between the wickets, and longer periods of low-intensity activity, such as standing in the field (Weldon et al., 2021). Having good aerobic endurance fitness allows players to recover quickly between these bouts of activity and perform at a high level for the entire game (Ahamad et al., 2015; Orchard et al., 2005; Panwar & Chandel, 2019). It also helps to reduce the risk of injury and improves overall physical health (Paoli et al., 2013). In addition to improving performance on the field, aerobic endurance fitness can also have long-term health benefits for cricket players (Vickery et al., 2018). Cricket is a popular sport in South Asia, and both Bangladesh and India have a significant presence in international cricket. In recent years, female cricket players from both countries have shown promising performances, and there has been growing interest in their fitness levels. This study aimed to compare the aerobic endurance fitness levels of elite female cricket players from Bangladesh and India.

METHODOLOGY

Subject

For this study, fifty (50) female cricket players were chosen at random, 25 of them were Senior Women's Cricket Players of Punjab Cricket Association of India and the remaining 25 were Divisional Cricket Players of Bangladesh. They have 4-15 years of training age at the time of collection of data.

Variables

The dependent variable in this study was aerobic endurance fitness, and the independent variable was nationality. Aerobic endurance fitness were measured using the Yo-Yo Intermittent Recovery Test level 1 (Yo-Yo IR1). This test has been validated for cricket players and is widely used in sports science research.

Procedure

The participants were informed about the purpose of the study and the testing procedures. They signed a consent form before participating in the study. The Yo-Yo IR1 test conducted on a standard cricket field. The test involved running back and forth between two cones placed 20 meters apart along with 5 meter recovery area, following an audio signal. The running speed gradually increased, and the participants had to reach the cones before the audio signal to continue the test. The test continued until the participant couldn't keep up with the audio signal or complete two consecutive levels.

Statistical analysis

The data collected were analysed using descriptive statistics and inferential statistics. The test of Normality, mean and standard deviation calculated for each group, and a t-test used to compare the mean scores of the two groups. A p-value of less than .05 considered statistically significant. The data were analysed using statistical software SPSS version 26.

Ethical considerations

The study conducted in accordance with ethical principles and guidelines for research involving human subjects. The participants were informed about the purpose and procedures of the study, and their consent were obtained before participation. Confidentiality of the participants' information had maintained throughout the study.

Limitations

The study limited by the sample size and the representativeness of the participants. The study might not be generalizable to all female cricket players from Bangladesh and India. The results might also be affected by factors such as training and nutrition, which were not controlled in this study.

RESULTS

Table 1. Normality test of collected data.

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
India	.186	25	.025	.931	25	.093
Bangladesh	.161	25	.094	.961	25	.428

Note. a. Lilliefors Significance Correction.

The above Table 1 present the results from two well-known tests of normality namely the Kolmogorov-Smirnov test and Shapiro-Wilk test. The Kolmogorov-Smirnov and Shapiro-Wilk test is more appropriate for small sample size (<50) but can also handle sample size large as 2000. For this reason, we have been used the Kolmogorov-Smirnov and Shapiro-Wilk test for our numerical means of assessing normality. It is seen from the above Table 1 that the collected data were normally distributed. As Kolmogorov-Smirnov and Shapiro-Wilk test is ($p \geq .05$), data is normal. If it is ($p \leq .05$), then significantly deviate from normal distribution. So, Kolmogorov-Smirnov and Shapiro-Wilk suggest that the data is normally distributed and statistically confirmed for the comparative inferential parameter treatment.

According to Table 2, the average distance run by female cricketers from Bangladesh and India was 857.6 m and 1233.6 m, respectively. The resulting 't' ratio of 4.631 exceeds the table value of 2.009 for df 48

necessary for significance at .05 levels. The female cricketers from India and Bangladesh were found to have significantly different in total distance run.

Table 2. Calculated “t” values of female cricketers from Bangladesh and India in total distance run.

		Mean (m)	N	Std. Deviation	Std. Error Mean	df	t
Total distance covered	India	1233.6	25	330.99	66.20	48	4.631
	Bangladesh	857.6	25	234.96	46.99		

Note. *Significant at .05 level.

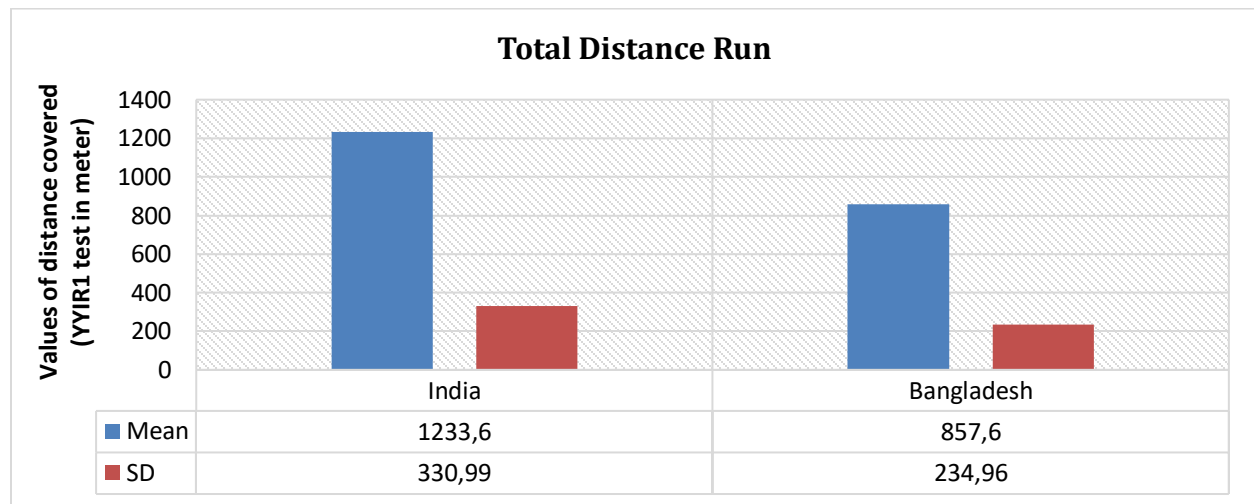


Figure 1. Values of total distance run of female cricketers from Bangladesh and India.

Table 2. Average VO_{2max} and calculated “t” values of female cricketers from Bangladesh and India.

		Mean	N	Std. Deviation	Std. Error Mean	df	t
VO _{2max}	India	46.76	25	1.96	.62	48	4.688
	Bangladesh	43.60	25	1.79	.57		

Note. *Significant at .05 level.

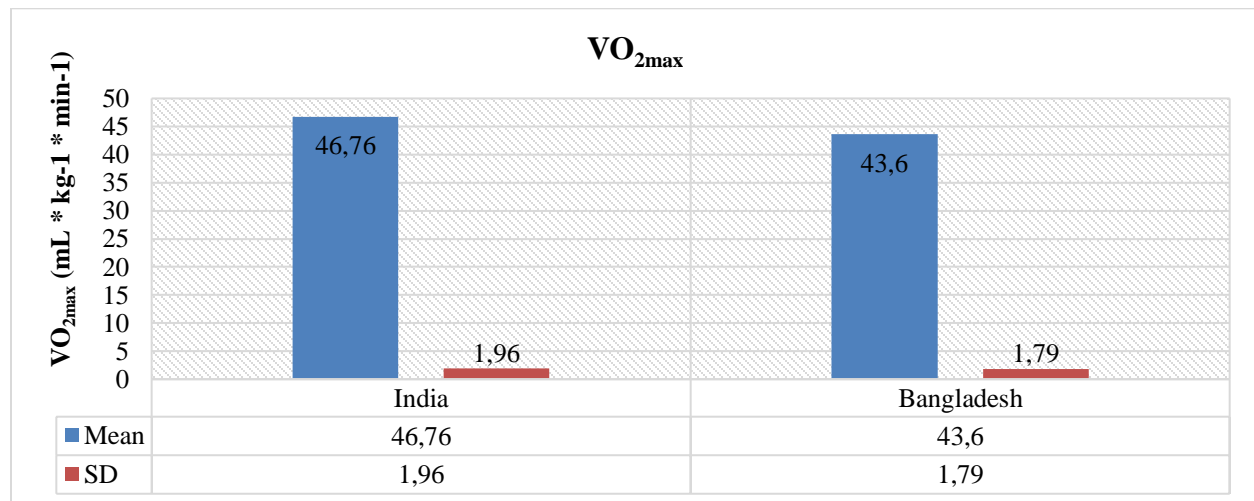


Figure 2. VO_{2max} values of female cricketers from Bangladesh and India

According to Table 3, the average VO_{2max} values for female cricketers from Bangladesh and India were $43.60 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ and $46.76 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$, respectively. The calculated 't' ratio of 4.688 is higher than the 2.009 in the tabulated value for df 48 needed for significance at .05 levels. It was determined that the female cricketers from Bangladesh and India had significantly different in VO_{2max} values.

DISCUSSION

The results of the study showed that the Indian Women's Cricket Players had a significantly better YYIRT1 performance than the Bangladeshi Women Cricket Players. On average, the Indian Women's Cricket Players were able to run 300 meters further than the Bangladeshi Women Cricket Players before stopping due to fatigue. There could be several reasons for this difference in performance. The Indian Women's Cricket Players have more experience and training, which could contribute to better aerobic capacity and recovery. Additionally, the Indian Women's Cricket Players may have access to better resources such as coaches and training facilities.

The Yo-Yo Intermittent Recovery Test level 1 (Yo-Yo IR1) is a commonly used field-based test to measure an individual's ability to perform repeated high-intensity exercise with brief recovery periods. It is often used to assess an athlete's aerobic endurance and has been found to be a good predictor of VO_{2max} in athletes (Castagna et al., 2005; Deprez et al., 2014; Krstrup et al., 2003; Souhail et al., 2010). Research has shown a positive correlation between the distance covered in the Yo-Yo IR1 and VO_{2max} . This means that athletes who perform well on the Yo-Yo IR1 test tend to have higher VO_{2max} scores, indicating better aerobic fitness and endurance capacity (Karakoç et al., 2012; Thomas et al., 2006). Therefore, the Yo-Yo IR1 test is a valuable tool for coaches and trainers to use in assessing an athlete's aerobic fitness and endurance capacity, as well as tracking improvements in these areas over time. VO_{2max} , also known as maximal oxygen uptake, is a measure of the maximum amount of oxygen that an individual can consume during intense exercise. It is an important indicator of cardiovascular fitness and endurance performance in athletes, including cricketers (Krstrup et al., 2003). Table 3 showed that the female cricketers from India and Bangladesh were found to have significantly different in VO_{2max} . The Indian female cricketers performed better than Bangladeshi female cricketers in VO_{2max} . This difference in VO_{2max} levels between the two groups of female cricketers might have implications for their performance and training programs. The results of this study concur with the research of Sandhu & Singh (2018), who made it abundantly evident that in terms of the Yo-Yo Intermittent Recovery Test Level 1 (YYIRT1), Punjab (India) women cricketers perform more frequently high-intensity aerobic activities than Dhaka (Bangladesh) women cricketers (Sandhu & Singh, 2018). In female cricketers, VO_{2max} has been found to be particularly important for performance in the fielding aspect of the game. This is because fielding requires a lot of running and sprinting, and athletes with higher VO_{2max} scores are better able to sustain high-intensity exercise for longer periods of time without experiencing fatigue. Improving VO_{2max} can be achieved through a variety of training methods, including aerobic exercise (such as running or cycling), interval training, and high-intensity interval training. However, it's important for cricket players to work with qualified coaches and trainers to develop a training program that is specifically tailored to their individual needs and goals.

CONCLUSION

The findings of this study conclude that there is a significant difference in endurance fitness levels between Indian Women Cricket Players and Bangladeshi Women's Cricket Players where Indian female cricket players perform better than Bangladeshi female cricketers. This is indicating that there may be a need for further training and resources for the Bangladeshi Women Cricket Players to improve their performance. This

study provides valuable insights for coaches and trainers to design more effective training programs for female cricket players at different levels.

AUTHOR CONTRIBUTIONS

Farjana Akter Boby often conducted the literature search, experiments, gathered data, wrote the initial draft, handling revisions, and ensuring the manuscript's submission and publication process. She was often the lead researcher who supervised the project, secured funding, and provided overall guidance. Manisha Badhan made unique contributions to the study, such as proofreading the article and helping with the data collection, data analysis and experiment design.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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REFERENCES

- Ahamad, G., Naqvi, S. K., Beg, M. M. S., & Ahmed, T. (2015). A Web based System for Cricket Talent Identification, Enhancement and Selection (C-TIES). *Procedia Computer Science*, 62, 134-142. <https://doi.org/10.1016/j.procs.2015.08.426>
- Barth, K., Linkerhand, A., & Barth, K. (2007). *Training Volleyball* (1st ed.). Meyer & Meyer Sport.
- Castagna, C., Abt, G., & D'Ottavio, S. (2005). Competitive-level differences in Yo-Yo intermittent recovery and twelve minute run test performance in soccer referees. *Journal of Strength and Conditioning Research*, 19(4), 805-809. <https://doi.org/10.1519/R-14473.1>
- Deprez, D., Coutts, A. J., Lenoir, M., Fransen, J., Pion, J., Philippaerts, R., & Vaeyens, R. (2014). Reliability and validity of the Yo-Yo intermittent recovery test level 1 in young soccer players. *Journal of Sports Sciences*, 32(10), 903-910. <https://doi.org/10.1080/02640414.2013.876088>
- Haskell, W. L., Lee, I.-M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., Macera, C. A., Heath, G. W., Thompson, P. D., & Bauman, A. (2007). Physical Activity and Public Health: Updated Recommendation for Adults from the American College of Sports Medicine and the American Heart Association. *Medicine & Science in Sports & Exercise*, 39(8), 1423-1434. <https://doi.org/10.1249/mss.0b013e3180616b27>
- Jeffreys, I., & Moody, J. (2021). *Strength and conditioning for sports performance* (2nd Edition). Routledge. <https://doi.org/10.4324/9780429330988>

- Karakoç, B., Akalan, C., Alemdaroğlu, U., & Arslan, E. (2012). The Relationship between the Yo-Yo Tests, Anaerobic Performance and Aerobic Performance in Young Soccer Players. *Journal of Human Kinetics*, 35(1), 81-88. <https://doi.org/10.2478/v10078-012-0081-x>
- Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., Pedersen, P. K., & Bangsbo, J. (2003). The yo-yo intermittent recovery test: Physiological response, reliability, and validity. *Medicine and Science in Sports and Exercise*, 35(4), 697-705. <https://doi.org/10.1249/01.MSS.0000058441.94520.32>
- Marques, M. C., van den Tillaar, R., Gabbett, T. J., Reis, V. M., & González-Badillo, J. J. (2009). Physical fitness qualities of professional volleyball players: Determination of positional differences. *Journal of Strength and Conditioning Research*, 23(4), 1106-1111. <https://doi.org/10.1519/JSC.0b013e31819b78c4>
- Noakes, T. D., & Durandt, J. J. (2000). Physiological requirements of cricket. *Journal of Sports Sciences*, 18(12), 919-929. <https://doi.org/10.1080/026404100446739>
- Orchard, J., Newman, D., Stretch, R., Frost, W., Mansingh, A., & Leipus, A. (2005). Methods for injury surveillance in international cricket. *Journal of Science and Medicine in Sport*, 8(1), 1-14. [https://doi.org/10.1016/S1440-2440\(05\)80019-2](https://doi.org/10.1016/S1440-2440(05)80019-2)
- Panwar, handrabhan S., & Chandel, S. (2019). Construction of Specific Physical Fitness Test for Cricket Players. *Journal of Advances and Scholarly Researches in Allied Education*, 16(5), 1518-1520 (3).
- Paoli, A., Pacelli, Q. F., Moro, T., Marcolin, G., Neri, M., Battaglia, G., Sergi, G., Bolzetta, F., & Bianco, A. (2013). Effects of high-intensity circuit training, low-intensity circuit training and endurance training on blood pressure and lipoproteins in middle-aged overweight men. *Lipids in Health and Disease*, 12(1), 131. <https://doi.org/10.1186/1476-511X-12-131>
- Petersen, C. J., Pyne, D. B., Portus, M. R., & Dawson, B. T. (2011). Comparison of player movement patterns between 1-day and test cricket. *Journal of Strength and Conditioning Research*, 25(5), 1368-1373. <https://doi.org/10.1519/JSC.0b013e3181da7899>
- Petersen, C. J., Pyne, D., Dawson, B., Portus, M., & Kellett, A. (2010). Movement patterns in cricket vary by both position and game format. *Journal of Sports Sciences*, 28(1), 45-52. <https://doi.org/10.1080/02640410903348665>
- Petersen, C., Pyne, D. B., Portus, M. R., & Dawson, B. (2009). Quantifying positional movement patterns in Twenty20 cricket. *International Journal of Performance Analysis in Sport*, 9(2), 165-170. <https://doi.org/10.1080/24748668.2009.11868474>
- Raja, W. (2019). Measuring Aerobic Capacity of Cricket Players Off and On The Altitude Astrand-Ryhming Sub Maximal Aerobic Test. *Journal of Physical Education Research*, 6(3), 46-49.
- Sandhu, R. S., & Singh, N. (2018). A Study of Yo-Yo Intermittent Recovery Test Level 1 (YYIRTL1) between Indian and Bangladesh Women Cricketers. *European Journal of Physical Education and Sport Science*, 4(1), 235-240. <https://zenodo.org/record/1169600>
- Sholto-Douglas, R., Cook, R., Wilkie, M., & Christie, C. J.-A. (2020). Movement Demands of an Elite Cricket Team during the Big Bash League in Australia. *Journal of Sports Science & Medicine*, 19(1), 59-64.
- Smita Wagh, Yatin Wagh, & Kamini D Nikam. (2022). Assessment of role of physical fitness of cricket players in response to the various tests. *Asian Journal of Medical Sciences*, 13(7), 223-227. <https://doi.org/10.3126/ajms.v13i7.44498>
- Souhail, H., Castagna, C., Mohamed, H. Y., Younes, H., & Chamari, K. (2010). Direct validity of the yo-yo intermittent recovery test in young team handball players. *Journal of Strength and Conditioning Research*, 24(2), 465-470. <https://doi.org/10.1519/JSC.0b013e3181c06827>
- Stretch, R. A., Bartlett, R., & Davids, K. (2000). A review of batting in men's cricket. *Journal of Sports Sciences*, 18(12), 931-949. <https://doi.org/10.1080/026404100446748>

- Thomas, A., Dawson, B., & Goodman, C. (2006). The yo-yo test: Reliability and association with a 20-m shuttle run and VO₂max. *International Journal of Sports Physiology and Performance*, 1(2), 137-149. <https://doi.org/10.1123/ijsp.1.2.137>
- Vickery, W., Dascombe, B. J., & Scanlan, A. T. (2018). A review of the physical and physiological demands associated with cricket fast and spin bowlers. *International Journal of Sports Science & Coaching*, 13(2), 290-301. <https://doi.org/10.1177/1747954117731051>
- Weldon, A., Clarke, N., Pote, L., & Bishop, C. (2021). Physical profiling of international cricket players: An investigation between bowlers and batters. *Biology of Sport*, 38(4), 507-515. <https://doi.org/10.5114/biolsport.2021.100148>
- Wuest, D. A., & Bucher, C. A. (1995). *Foundations of physical education and sport* (12th ed). Mosby.

