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Analysis of yo-yo intermittent recovery test level-1 between batter and bowler in cricket

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Abstract

Yo-Yo intermittent tests are often used to assess physical fitness in a range of sports and scientific projects. The Yo-Yo intermittent recovery test, in particular, was a reliable indicator of fitness level in terms of total distance covered in meters, maximum oxygen consumption in VO₂ Max, and levels achieved. The purpose of the research is to examine the aerobic endurance fitness of women cricket bowlers and batters using the Yo-Yo Intermittent Recovery test level 1. The capacity to perform intervals repeatedly over an extended length of time was measured in this study. A total of 60 female cricket players were chosen for this study. Out of these, 30 were bowlers, while the other 30 were batters. On these, the YYIRT 1 test was run. The test was carried out until the subject was able to do so, until the beep rang, or if the subject received two warning signals at once for failing to reach the endpoint. Total distance covered and VO₂ max were evaluated as outcome measures to compare two groups of batters and bowlers according to their respective playing positions. This study demonstrated that there is a significant difference in performance, i.e., total distance covered, levels reached, and VO₂ max, between batters and bowlers.

Keywords: YYIR test level-1, Levels achieved, VO₂Max

Introduction

One of the most significant topics in contemporary sports is the evaluation of athletes' physical capabilities. Field and laboratory tests are used by coaches and sport scientists to screen applicants, make selections, or assess the effectiveness of training program^[1]. Many field tests have been created to evaluate an athlete's physical capabilities. Due to its specificity and usefulness, yo-yo tests have quickly become one of the most thoroughly researched shuttle run tests in sports science^[2]. It is believed that yo-yo tests are one of the most efficient field-based methods for evaluating the endurance performance of soccer players. These tests have also been used to evaluate players' abilities to repeatedly perform high-intensity exercise in many team sports, including soccer, cricket, basketball, and rugby^[3],^{[3]-[6]}. This test estimates one's maximum level of aerobic endurance^[3]. The Yo-Yo Intermittent Recovery Test Level 1, often known as YYIRT1, IR1, or something similar, is the most widely used version of the yo-yo test despite the fact that there are many other variations^[7]. The Yo-Yo IR level 1 (Yo-Yo IR1) test measures the ability to engage in intermittent activity that activates the aerobic system to its fullest extent^[4].

It was developed to gauge a person's personal aerobic capacity by measuring their VO₂ Max, or the maximum or ideal rate at which their heart, lungs, and muscles can efficiently utilize oxygen during exercise. It has been one of the most often utilized aerobic field tests since that time. As a result, this predicts VO₂ Max across athletes who compete at different levels of competitiveness and in different sports^[8].

In the early years of cricket and even only a few years ago, endurance was a factor that was frequently overlooked. However, many later understood how crucial it is, particularly in cricket formats like ODI and Test. These kinds of tests assist coaches in determining which athletes need to improve their endurance. Currently, the Yo-Yo Intermittent Recovery (IR) Test is utilized to evaluate the endurance capabilities of female cricket players. By correctly comprehending the test, practicing intermittent running, doing weight training, and engaging in high-intensity interval training, one may do well and get better results on the YYIR test

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level 1. Weekly test sessions and technical training for the beep-sound shuttle run will also aid to increase physical prowess, physical fitness, and mental alertness. The level 1 Yo-Yo intermittent recovery test is useful for assessing a person's sensitivity to training as well as their various physical capacities^[9]. Therefore, the purpose of this study was to evaluate the level 1 Yo-Yo Intermittent Recovery Test results for the aerobic endurance fitness of female cricket bowlers and batters.

Methodology

a) Selection of Subjects: For the purpose of the study, sixty (N=60) female cricket players of 16 to 27 years of age who had participated at least at the Division level were chosen. Two groups of 60 Cricket players were formed i.e. One group consists of thirty (N1=30) bowlers and other of thirty (N2=30) batters. According to local legislation, all participants had formal medical clearance. All participants and parents gave their verbal and written permission after being informed of the study's possible dangers and experimental methodology. It was made clear to participants that they might leave the research at any moment without incurring any penalties.

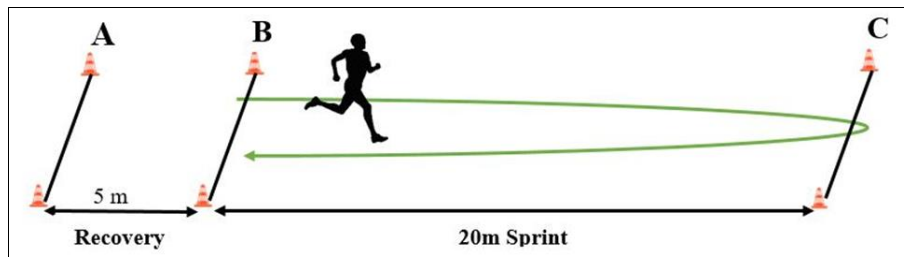
b) Variables Selected: In consultation with experts, a

feasibility analysis was made to determine which variables or skills could be used for the investigation while taking into account the availability of tools, the suitability of the subjects, the legitimate time that could be devoted to tests, and to keep the entire study unitary and integrated. The Yo-Yo Intermittent Recovery Test Level 1 (YYIRTL1) was chosen for the current investigation keeping in mind the aforementioned requirements.

c) Equipment Required

- Flat, non-slip surface, at least 30m long, and an appropriate width based on the number of participants.
- Measuring tape of at least 20 meters.
- Marker cones.
- Audio cd or mp3.
- Cd or mp3 player.
- Loud speakers.
- Recording sheets and pen
- Drink Bottle: some athletes may wish to drink in their recovery area during the yo-yo intermittent tests for occasional small drinks to keep hydrated.

Course layout: Cones or tape is used to mark out three parallel lines, 5 and 20 meters apart, as shown in the diagram.



Preparations: Make sure the participants are adequately prepared: well-rested, hydrated and fueled, and familiar with the test procedure and motivated to perform maximally. Give clear and standardized instructions about the test and what is expected of them including the importance of keeping in time to the recording and completing the full 20m run.

Starting the Test: All participants should line up along the starting line. The athletes start with a foot behind the middle line (cone B), and begin running when instructed by the audio recording. The athlete turns when signaled by the recorded audio beep (at cone C), and returns to the starting point. The athlete must not start running early, must run the complete distance, and reach each line before or in time with the recording.

During the test: There is an active recovery period of 10 seconds between every 40 meters run, during which the subject must walk or jog to the next line (cone A) and return to the starting point. At regular intervals, the running speed will increase. The starting speed for the Level 1 Intermittent Recovery Test is 10.0km/hr, and increases to 12km/hr, 13km/hr, then increasing by 0.5 km/hr thereafter.

Finishing the test: The participants must continue for as long as they can. Some of the athletes will choose to stop when they have reached their physical limit. For others, you will need to give a warning as they drop behind the required pace or make one of the errors listed below. On the second infraction you pull them out of the test. You give a warning when the participant

- Does not come to a complete stop before starting the next 40m run.
- Starts the run before the audio signal.
- Does not reach either line before the audio signal.
- Turns at the 20m mark without touching or going over the line (therefore running short).

Scoring: The shuttle at which the second warning occurs is not counted, e.g. if the second warning occurs at level 16.4, the athlete's score is 16.3. When an athlete voluntarily withdraws before a second warning, the last shuttle completed successfully is their score. There are scoring sheets for each test version to keep track of athlete scores during the test.

Interpretation: You can use the YYIR1 table of norms to work out a fitness rating based on the score. There has been formula published for estimating VO_{2max} (ml/min/kg) from the Yo-Yo IRI results.

Outcome Measure

Total distance is much simpler to understand, calculate and widely used, whereas level achieved is more complex as the test begins at level 5 and then skips to level 9 at the beginning.

Total Distance

This is the simplest, most common, and perhaps the most reliable method of reporting YYIR test performance. To calculate total distance, the simplest method is to record the number of shuttles completed by the participant and then multiply that number by 40 (40 = 2 x 20m shuttles [the run

from cone B to cone C = 20m, then run back from cone C to cone B = 20m]). For example, if an athlete performs 30 shuttles, this number can then be multiplied by 40 to calculate their total distance (e.g., 30 x 40 = 1,200m)

Level Achieved

To calculate the levels which are achieved by the player is according to the speed is one of the ways to evaluate the test result. Below are the levels, speeds and accumulated distances for the Yo-Yo Intermittent Recovery Test 1. The results can be given as the total distance covered, level number achieved, or speed level (such as 16.3, which would mean level 30 or 1200 meters). The results normally report the speed level plus number of shuttles.

Table 1: Yo-Yo Intermittent recovery test-level 1

| Speed Level | Shuttle No. | speed (km/hr) | level time (s) | accumulated shuttle dist (m) | Cumulative Time* (s) | Approx Vo2max (mL/min/kg) |
|-------------|-------------|------------------|-------------------|------------------------------------|----------------------------|---------------------------------|
| 5 | 1 | 10 | 14.4 | 40 | 00:24 | 36.74 |
| 9 | 1 | 12 | 12.5 | 80 | 00:46 | 37.07 |
| 11 | 1 | 13 | 11.1 | 120 | 01:07 | 37.41 |
| 11 | 2 | 13 | 11.1 | 160 | 01:29 | 37.74 |
| 12 | 1 | 13.5 | 10.7 | 200 | 01:49 | 38.08 |
| 12 | 2 | 13.5 | 10.7 | 240 | 02:10 | 38.42 |
| 12 | 3 | 13.5 | 10.7 | 280 | 02:31 | 38.75 |
| 13 | 1 | 14 | 10.3 | 320 | 02:51 | 39.09 |
| 13 | 2 | 14 | 10.3 | 360 | 03:11 | 39.42 |
| 13 | 3 | 14 | 10.3 | 400 | 03:31 | 39.76 |
| 13 | 4 | 14 | 10.3 | 440 | 03:52 | 40.10 |
| 14 | 1 | 14.5 | 9.9 | 480 | 04:12 | 40.43 |
| 14 | 2 | 14.5 | 9.9 | 520 | 04:32 | 40.77 |
| 14 | 3 | 14.5 | 9.9 | 560 | 04:51 | 41.10 |
| 14 | 4 | 14.5 | 9.9 | 600 | 05:11 | 41.44 |
| 14 | 5 | 14.5 | 9.9 | 640 | 05:31 | 41.78 |
| 14 | 6 | 14.5 | 9.9 | 680 | 05:51 | 42.11 |
| 14 | 7 | 14.5 | 9.9 | 720 | 06:11 | 42.45 |
| 14 | 8 | 14.5 | 9.9 | 760 | 06:31 | 42.78 |
| 15 | 1 | 15 | 9.6 | 800 | 06:51 | 43.12 |
| 15 | 2 | 15 | 9.6 | 840 | 07:10 | 43.46 |
| 15 | 3 | 15 | 9.6 | 880 | 07:30 | 43.79 |
| 15 | 4 | 15 | 9.6 | 920 | 07:50 | 44.13 |
| 15 | 5 | 15 | 9.6 | 960 | 08:09 | 44.46 |
| 15 | 6 | 15 | 9.6 | 1000 | 08:29 | 44.80 |
| 15 | 7 | 15 | 9.6 | 1040 | 08:48 | 45.14 |
| 15 | 8 | 15 | 9.6 | 1080 | 09:08 | 45.47 |
| 16 | 1 | 15.5 | 9.3 | 1120 | 09:27 | 45.81 |
| 16 | 2 | 15.5 | 9.3 | 1160 | 09:47 | 46.14 |
| 16 | 3 | 15.5 | 9.3 | 1200 | 10:06 | 46.48 |
| 16 | 4 | 15.5 | 9.3 | 1240 | 10:25 | 46.82 |
| 16 | 5 | 15.5 | 9.3 | 1280 | 10:44 | 47.15 |
| 16 | 6 | 15.5 | 9.3 | 1320 | 11:04 | 47.49 |
| 16 | 7 | 15.5 | 9.3 | 1360 | 11:23 | 47.82 |
| 16 | 8 | 15.5 | 9.3 | 1400 | 11:42 | 48.16 |
| 17 | 1 | 16 | 9 | 1440 | 12:01 | 48.50 |
| 17 | 2 | 16 | 9 | 1480 | 12:20 | 48.83 |
| 17 | 3 | 16 | 9 | 1520 | 12:39 | 49.17 |
| 17 | 4 | 16 | 9 | 1560 | 12:58 | 49.50 |
| 17 | 5 | 16 | 9 | 1600 | 13:17 | 49.84 |
| 17 | 6 | 16 | 9 | 1640 | 13:36 | 50.18 |
| 17 | 7 | 16 | 9 | 1680 | 13:55 | 50.51 |
| 17 | 8 | 16 | 9 | 1720 | 14:14 | 50.85 |
| 18 | 1 | 16.5 | 8.7 | 1760 | 14:33 | 51.18 |
| 18 | 2 | 16.5 | 8.7 | 1800 | 14:52 | 51.52 |
| 18 | 3 | 16.5 | 8.7 | 1840 | 15:10 | 51.86 |
| 18 | 4 | 16.5 | 8.7 | 1880 | 15:29 | 52.19 |
| 18 | 5 | 16.5 | 8.7 | 1920 | 15:48 | 52.53 |
| 18 | 6 | 16.5 | 8.7 | 1960 | 16:07 | 52.86 |
| 18 | 7 | 16.5 | 8.7 | 2000 | 16:25 | 53.20 |
| 18 | 8 | 16.5 | 8.7 | 2040 | 16:44 | 53.54 |
| 19 | 1 | 17 | 8.5 | 2080 | 17:03 | 53.87 |
| 19 | 2 | 17 | 8.5 | 2120 | 17:21 | 54.21 |
| 19 | 3 | 17 | 8.5 | 2160 | 17:39 | 54.54 |
| 19 | 4 | 17 | 8.5 | 2200 | 17:58 | 54.88 |
| 19 | 5 | 17 | 8.5 | 2240 | 18:16 | 55.22 |
| 19 | 6 | 17 | 8.5 | 2280 | 18:35 | 55.55 |
| 19 | 7 | 17 | 8.5 | 2320 | 18:53 | 55.89 |
| 19 | 8 | 17 | 8.5 | 2360 | 19:12 | 56.22 |
| 20 | 1 | 17.5 | 8.2 | 2400 | 19:30 | 56.56 |
| 20 | 2 | 17.5 | 8.2 | 2440 | 19:48 | 56.90 |
| 20 | 3 | 17.5 | 8.2 | 2480 | 20:07 | 57.23 |
| 20 | 4 | 17.5 | 8.2 | 2520 | 20:25 | 57.57 |
| 20 | 5 | 17.5 | 8.2 | 2560 | 20:43 | 57.90 |
| 20 | 6 | 17.5 | 8.2 | 2600 | 21:01 | 58.24 |
| 20 | 7 | 17.5 | 8.2 | 2640 | 21:19 | 58.58 |
| 20 | 8 | 17.5 | 8.2 | 2680 | 21:38 | 58.91 |
| 21 | 1 | 18 | 8.0 | 2720 | 21:56 | 59.25 |
| 21 | 2 | 18 | 8.0 | 2760 | 22:14 | 59.58 |
| 21 | 3 | 18 | 8.0 | 2800 | 22:32 | 59.92 |
| 21 | 4 | 18 | 8.0 | 2840 | 22:50 | 60.26 |
| 21 | 5 | 18 | 8.0 | 2880 | 23:08 | 60.59 |
| 21 | 6 | 18 | 8.0 | 2920 | 23:26 | 60.93 |
| 21 | 7 | 18 | 8.0 | 2960 | 23:44 | 61.26 |
| 21 | 8 | 18 | 8.0 | 3000 | 24:02 | 61.60 |
| 22 | 1 | 18.5 | 7.8 | 3040 | 24:19 | 61.94 |
| 22 | 2 | 18.5 | 7.8 | 3080 | 24:37 | 62.27 |
| 22 | 3 | 18.5 | 7.8 | 3120 | 24:55 | 62.61 |
| 22 | 4 | 18.5 | 7.8 | 3160 | 25:13 | 62.94 |
| 22 | 5 | 18.5 | 7.8 | 3200 | 25:31 | 63.28 |
| 22 | 6 | 18.5 | 7.8 | 3240 | 25:48 | 63.62 |
| 22 | 7 | 18.5 | 7.8 | 3280 | 26:06 | 63.95 |
| 22 | 8 | 18.5 | 7.8 | 3320 | 26:24 | 64.29 |
| 23 | 1 | 19 | 7.6 | 3360 | 26:42 | 64.62 |
| 23 | 2 | 19 | 7.6 | 3400 | 26:59 | 64.96 |
| 23 | 3 | 19 | 7.6 | 3440 | 27:17 | 65.30 |
| 23 | 4 | 19 | 7.6 | 3480 | 27:34 | 65.63 |
| 23 | 5 | 19 | 7.6 | 3520 | 27:52 | 65.97 |
| 23 | 6 | 19 | 7.6 | 3560 | 28:09 | 66.30 |
| 23 | 7 | 19 | 7.6 | 3600 | 28:27 | 66.64 |
| 23 | 8 | 19 | 7.6 | 3640 | 28:45 | 66.98 |

* Cumulative time includes 10 second recovery period between shuttles

VO² Max

Though the YYIR1 has been shown to be a moderately reliable predictor of VO² max [2, 10], it is advised to use the test for what it was originally developed for – identifying an individual’s ability to repeatedly perform high-intensity aerobic work, which has proven to be a more sensitive measure of changes in performance than VO²max. Regardless, for those who wish to use this method, the equations for calculating VO² max are below:

YYIR1 test: VO² max (mL * kg⁻¹ * min⁻¹) = IR1 distance (m) × 0.0084 + 36.4

Validity and Reliability

It is critical that the coach understands the test is both valid and reliable before they include it within their testing battery. Any test that lacks significant validity and/or reliability will produce worthless results that should not be used literally. Moreover, even a test with sufficient validity and reliability will still have some degree of error/inconsistency, but understanding how much is a crucial part of the data analysis. The YYIR1 has been repeatedly proven as a valid and reliable tool with high-reproducibility for measuring high-intensity aerobic capacity amongst athletes from various sports and competition-levels [3, 11-13]. Furthermore, the YYIR1 has also been shown to be a moderately reliable predictor of maximal oxygen uptake (VO² max) [2, 10].

Table 2: Statistical Analysis

| Tests of Normality | | | | | | | |
|------------------------|----------|---------------------------------|----|------|--------------|----|------|
| | Category | Kolmogorov-Smirnov ^a | | | Shapiro-Wilk | | |
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| VO2 Max (mL/min/kg) | Batter | .158 | 30 | .053 | .965 | 30 | .404 |
| | Bowler | .140 | 30 | .139 | .964 | 30 | .397 |
| Distance | Batter | .158 | 30 | .053 | .965 | 30 | .404 |
| | Bowler | .140 | 30 | .139 | .964 | 30 | .397 |

a. Lilliefors Significance Correction

The data obtained were analyzed with IBM SPSS v26 ® statistical software. The data showed normal distribution. The Kolmogorov-Smirnov test and Shapiro-Wilk Test showed significant difference in p<0.05.

Mean and standard deviation were calculated in order to study the physical fitness components of the female batters and bowlers. The mean was computed for comparison of players of two groups. The “t-test” was used to determine the significant difference in performance, i.e., total distance covered, levels reached, and VO2 max, between batters and bowlers.

Results and Interpretation

Values of distance covered (YYIR1 test in meter)

Table 3: Mean Standard Deviation and ‘T’ Ratio on total distance covered by batter and bowler. Significant at 0.05, table value = 2.00 (df = 58)

| | Category | N | Mean | Std. Deviation | Std. Error Mean | T Value |
|----------|----------|----|---------|----------------|-----------------|---------|
| Distance | Batter | 30 | 892.00 | 238.88 | 43.61 | 4.981 |
| | Bowler | 30 | 1289.33 | 365.80 | 66.79 | |

Table-3 showed that the mean values of distance covered between the batters and bowlers were 892.00 and 1289.33 respectively. The obtained ‘t’ ratio of 4.981 is greater than the

table value 2.00 for df 58 required for significance at 0.05 levels. It was concluded that there was a significant difference occurred in total distance covered between the batter and bowler.

obtained 't' ratio of 5.149 is greater than the table value 2.00 for df 58 required for significance at 0.05 levels. It was concluded that there was a significant difference occurred in total distance covered between the batters and bowlers.

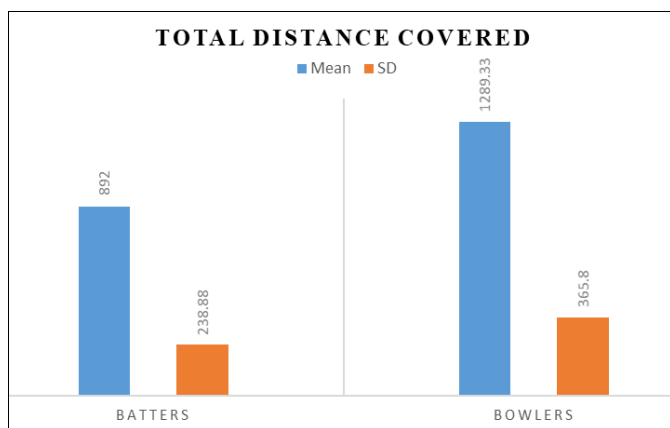


Fig 1: Graphical presentation of Mean, Standard Deviation on total distance covered between the batter and bowler.

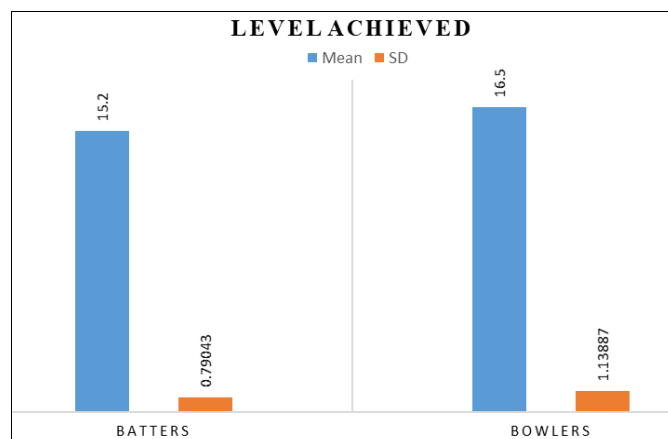


Fig 3: Graphical presentation of Mean, Standard Deviation on VO2max of the batters and bowlers

Values of VO2max (mL * kg⁻¹ * min⁻¹)

Table 4: Mean Standard Deviation and 'T' Ratio on VO2max of batter and bowler. Significant at 0.05, table value = 2.00 (df = 58).

| | Category | N | Mean | Std. Deviation | Std. Error Mean | t-value |
|--------|----------|----|---------|----------------|-----------------|---------|
| VO2max | Batter | 30 | 43.8953 | 2.00484 | .36603 | 4.981 |
| | Bowler | 30 | 47.2313 | 3.07245 | .56095 | |

Table-4 showed that the mean values of VO2max of the batters and bowlers were 43.8953 and 47.2313 respectively. The obtained 't' ratio of 4.981 is greater than the table value 2.00 for df 58 required for significance at 0.05 levels. It was concluded that there was a significant difference occurred in total distance covered between the batters and bowlers.

The above findings indicate that significant differences in total distance covered were discovered between Batters and Bowler, as the obtained t-value was greater than the tabulated value of 2.00. The results also revealed that Bowlers have performed better in total distance covered as well as in VO2max as compared to the Batters. The results might be attributed to their playing category, which includes different types of practices. Additionally it was found that there was significant difference in Level Achieved between the Batters and Bowlers. The results of the present scenario point out the positive quality of Bowlers as compared with Batters.

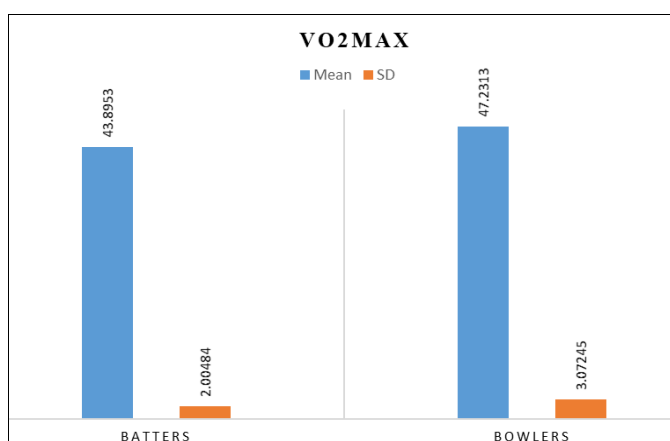


Fig 2: Graphical presentation of Mean, Standard Deviation on VO2max of the batters and bowlers.

Table 5: Mean Standard Deviation and 'T' Ratio on level achieved by batters and bowlers. Significant at 0.05, table value = 2.00 (df = 58)

| | Category | N | Mean | Std. Deviation | Std. Error Mean | T value |
|----------------|----------|----|------|----------------|-----------------|---------|
| Level Achieved | Batters | 30 | 15.2 | .79043 | .14431 | 5.149 |
| | Bowlers | 30 | 16.5 | 1.13887 | .20793 | |

Table-5 showed that the mean values of level achieved of the batters and bowlers were 15.2 and 16.5 respectively. The

Conclusion

- This study also found that there were significant differences between batters and bowlers in total covered distance, VO2Max and Levels achieved of YYIRT Level-1
- It was concluded that Bowlers had scored better in Level Achieved as compared to the Batters
- The results also revealed that Bowlers had performed better in total distance covered as well as in VO2max as compared to the Batters.

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