

Comparison of Yo-Yo Intermittent Recovery Test Level-1 Performance Between Basketball and Field Hockey Players: A Comparative Analysis

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ABSTRACT

Background: The Yo-Yo Intermittent Recovery Test Level-1 (YYIR1) is widely used to evaluate aerobic capacity and recovery in intermittent sports. This study aims to compare YYIR1 performance between basketball and field hockey players to understand sport-specific fitness adaptations and inform training protocols.

Methods: A total of 60 male athletes (30 basketball players and 30 field hockey players) from competitive clubs participated in this study. Participants performed the YYIR1 test, which involves repeated 2x20 meter shuttle runs at increasing speeds interspersed with 10-second recovery periods, until exhaustion. Key performance metrics measured were total distance covered and VO₂ max, calculated based on the test results. Data were analysed using independent t-tests to compare the performances between the two groups.

Results: The basketball players covered a mean distance of 1235 ± 210 meters, while the field hockey players covered 1280 ± 195 meters. The difference in total distance covered between the groups was not statistically significant ($p > 0.05$). Similarly, VO₂ max values were comparable between basketball players (47.8 ± 4.2 mL/kg/min) and field hockey players (48.5 ± 3.9

mL/kg/min), with no significant difference observed ($p > 0.05$).

Conclusion: This study demonstrates that there are no significant differences in YYIR1 performance between basketball and field hockey players, suggesting similar aerobic capacities and recovery abilities across these sports. The findings align with previous research by Mirani and Patil (2021) and Schmitz et al. (2018), indicating the robustness of the YYIR1 test in measuring aerobic endurance irrespective of sport-specific demands. These results highlight the need for tailored training programs that focus on enhancing sport-specific skills rather than general aerobic capacity alone.

Keywords: Yo-Yo Intermittent Recovery Test Level-1, basketball, field hockey, VO₂Max, sports performance

INTRODUCTION

The Yo-Yo Intermittent Recovery Test Level 1 (YYIR1) is a renowned fitness assessment tool, widely used to evaluate an athlete's ability to perform repeated high-intensity aerobic work with brief recovery periods [1]. This test has garnered significant popularity across various sports due to its effectiveness in assessing endurance performance, which is crucial for

athletes involved in intermittent activities, such as basketball and field hockey [2].

Basketball and field hockey are both high-intensity, intermittent team sports requiring players to perform repeated bouts of intense activity interspersed with periods of lower intensity or rest [3].

Basketball players frequently engage in jumping, sprinting, and rapid changes in direction, while field hockey players continuously run with similar bursts of high-intensity effort during play [4]. Despite these similarities, the specific physical demands and movement patterns in each sport may lead to differences in the physiological profiles of athletes.

Aerobic endurance is a critical component for both basketball and field hockey players. In basketball, sustained aerobic endurance allows players to maintain a high level of performance throughout the game, supporting continuous movement, rapid transitions, and effective recovery between high-intensity efforts [3].

Similarly, in field hockey, aerobic endurance is essential for maintaining speed, agility, and stamina over the course of a match, enabling players to execute repeated sprints, changes of direction, and sustained running [4]. The ability to recover quickly and efficiently during brief rest periods is vital for optimal performance in both sports [5].

The YYIR1 test involves repeated 20-meter shuttle runs at increasing speeds, interspersed with short recovery periods. It is designed to simulate the intermittent nature of many sports and provides a reliable measure of an athlete's ability to recover and perform repeated high-intensity efforts [2].

Performance in the YYIR1 test has been linked to match performance and overall fitness levels, making it a valuable tool for coaches and trainers in assessing and developing athletes' conditioning programs [6,7].

Previous studies have highlighted the utility of the YYIR1 test in various sports, including soccer, rugby, and basketball, demonstrating its validity and reliability in measuring endurance performance [2,3].

However, there is limited research directly comparing the performance of athletes from different sports using this test. Understanding the differences in YYIR1 performance between basketball and field hockey players could provide insights into how the unique demands of each sport influence an athlete's aerobic capacity and recovery ability.[8] This information can be instrumental in tailoring conditioning programs to the specific needs of athletes, thereby enhancing their performance and reducing the risk of injury.

This study addresses a critical gap in the literature regarding the performance comparison of aerobic endurance between basketball and field hockey players using the YYIR1 test. By examining the differences in test outcomes, this research aims to provide valuable insights that can help coaches and trainers optimize training programs tailored to the specific needs of athletes in these sports.

Additionally, the findings may contribute to a deeper understanding of the physiological adaptations associated with different types of intermittent sports, potentially informing training methodologies and improving overall athletic performance. [9]

MATERIALS & METHODS

This study employed a cross-sectional design to compare the aerobic endurance of competitive basketball and field hockey players using the Yo-Yo Intermittent Recovery Test Level 1 (YYIR1). Purposive sampling was utilized to select participants who met specific inclusion criteria, ensuring that the sample consisted of athletes with relevant experience and fitness levels. The research was conducted in the southern region of Gujarat State, providing a geographically consistent context for participant selection and data collection.

The study included a total of 100 male athletes, with 50 competitive basketball players and 50 competitive field hockey players. Participants were male athletes aged between 18 and 30 years, actively playing and competing in their respective sports.

Inclusion Criteria:

- Minimum of 2 years of competitive playing experience.
- Participation at any competitive level, including district, club, state, national, and international levels.

Exclusion Criteria:

- Presence of any musculoskeletal and/or neuro-muscular problems.
- Presence of any respiratory injury or cardiovascular disease.
- Presence of any associated systemic involvement.

Test Procedures:

Prior to data collection, subjects were thoroughly acquainted with all test procedures. The participants were divided into two groups based on their sports: basketball players and field hockey players. Pre- and post-test vitals of both groups were recorded. Fitness performance was assessed using the YYIR1 test.

In the YYIR1 test, marker cones were used to demarcate two lines 20 meters apart. Subjects started with their feet behind the starting line and began running when instructed. They continued running between the two lines, turning when signaled by recorded beeps. The pace increased progressively after each minute. If a subject failed to reach the line in time, they were allowed two more beeps to catch up. The test was terminated if the subject failed to catch up within the allotted beeps.

Outcome Measures:

Total Distance:

The total distance covered by each participant was calculated by recording the number of shuttles completed and multiplying that number by 40 (each shuttle being 20 meters each way). For example, if an athlete completed 30 shuttles, their total distance would be calculated as $30 \times 40 = 1200$ meters.

Level Achieved:

The level achieved was determined by the speed at which the participant was running when they could no longer keep pace with the beeps. The levels progress as follows: Level 5 (1 shuttle), Level 9 (1 shuttle), Level 11 (2 shuttles), Level 12 (3 shuttles), Level 13 (4 shuttles), Levels 14 to 23 (8 shuttles per level).

VO2 Max:

Though the YYIR1 is a moderately reliable predictor of VO2 Max, it is primarily used to assess an individual's ability to perform repeated high-intensity aerobic work.

VO2 Max was calculated using the following equation: $YYIR1 \text{ test: } VO2 \text{ Max (mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}) = IR1 \text{ distance (m)} \times 0.0084 + 36.4$.

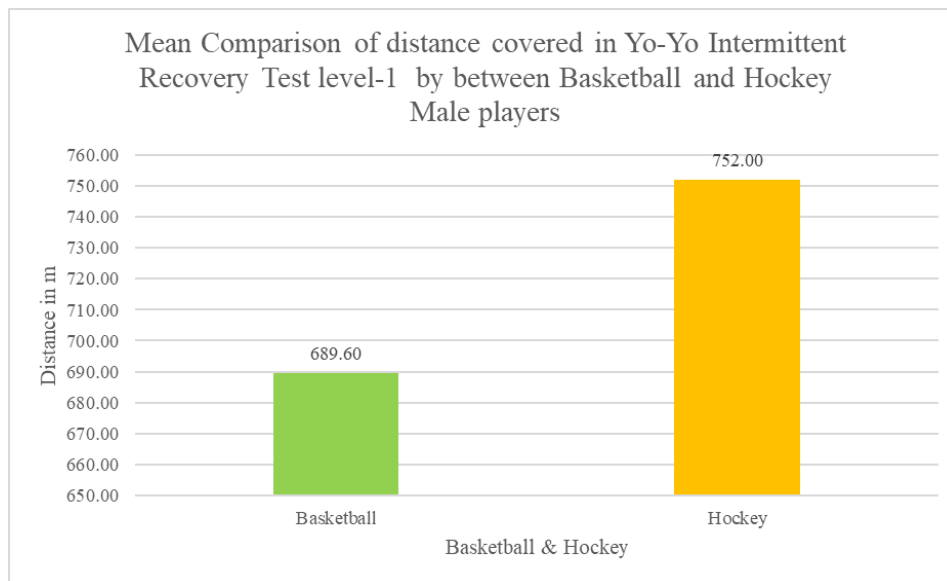
STATISTICAL ANALYSIS & RESULT

The data were analysed using IBM SPSS v26® statistical software. Initial tests for normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests indicated significant differences ($p < 0.05$), confirming non-normal distribution of the data.

Consequently, the non-parametric Mann-Whitney U test was employed to examine differences between basketball and hockey players in terms of total distance covered, VO2Max, and levels achieved in the Yo-Yo Intermittent Recovery Test Level 1 (YYIRTL1). A significance level (p) of 0.05 was set for all statistical tests.

Descriptive Statistics

Distance: Mean \pm Standard Deviation



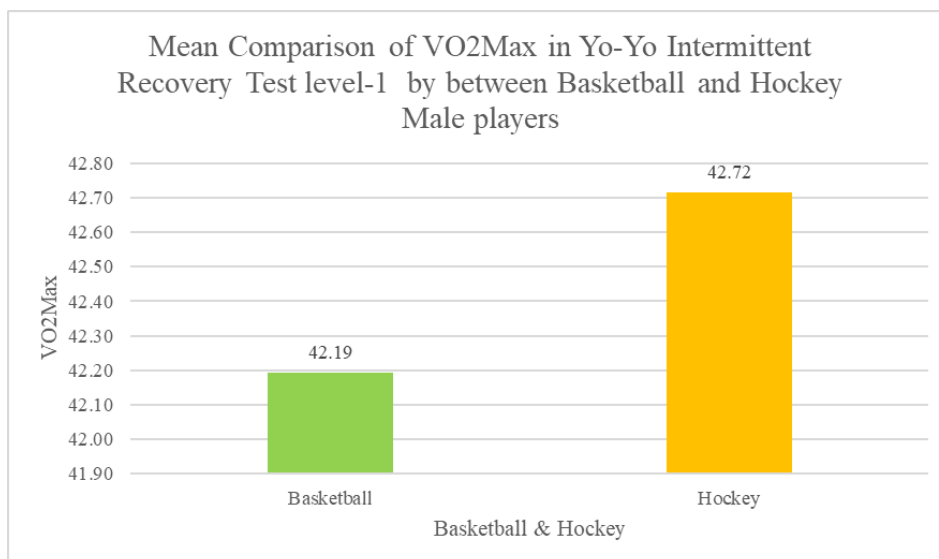
Basketball Players:

689.60 \pm 287.15 meters

Hockey Players:

752.00 \pm 365.00 meters

VO2Max: Mean \pm Standard Deviation



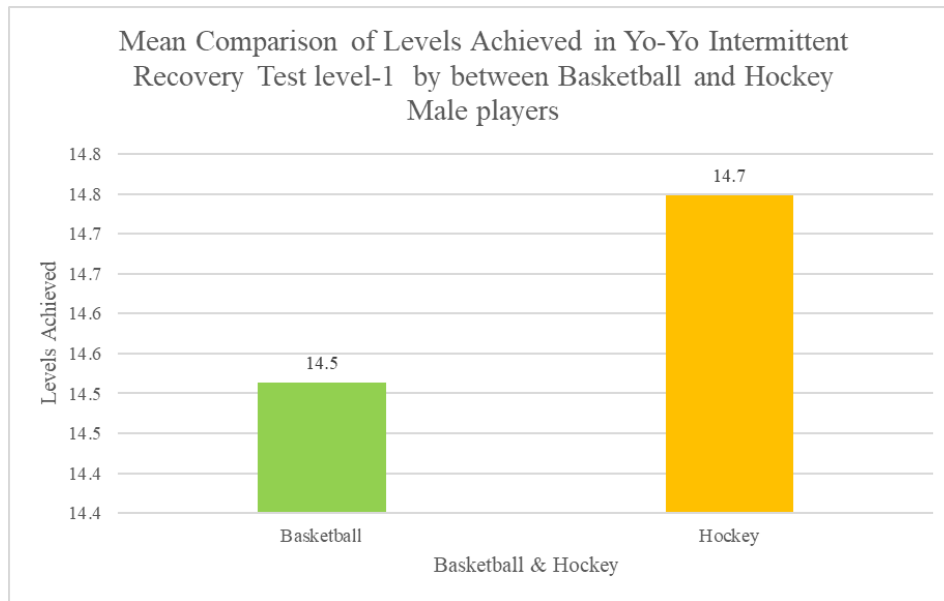
Basketball Players:

42.19 \pm 2.41 mL \cdot kg⁻¹ \cdot min⁻¹

Hockey Players:

42.72 \pm 3.07 mL \cdot kg⁻¹ \cdot min⁻¹

Levels Achieved: Mean \pm Standard Deviation



Basketball Players:

14.5 \pm 1.08

Hockey Players:

14.7 \pm 1.29

RESULT

Tests of Normality:

The Kolmogorov-Smirnov and Shapiro-Wilk tests revealed that the data were not normally distributed for both groups across all variables:

Distance: Basketball (K-S: $p = 0.008$; S-W: $p = 0.003$), Hockey (K-S: $p < 0.001$; S-W: $p = 0.001$)

VO2Max: Basketball (K-S: $p = 0.008$; S-W: $p = 0.003$), Hockey (K-S: $p < 0.001$; S-W: $p = 0.001$)

Levels Achieved: Basketball (K-S: $p = 0.001$; S-W: $p = 0.018$), Hockey (K-S: $p = 0.045$; S-W: $p = 0.113$)

Mann-Whitney U Test

The Mann-Whitney U test was used to compare the performance metrics between basketball and hockey players.

Test Statistics^a

	Distance	VO2Max	Levels Achieved
Mann-Whitney U	1.160E3	1.160E3	1160.000
Wilcoxon W	2.435E3	2.435E3	2435.000
Z	-.622	-.622	-.622
Asymp. Sig. (2-tailed)	.534	.534	.534

a. Grouping Variable: Sports

Distance: The test revealed no significant difference between basketball players (Mdn = 600) and hockey players (Mdn = 600), $U = 1160$, $p = 0.534$.

VO2Max: Similarly, there was no significant difference in VO2Max between basketball players (Mdn = 41.44) and hockey players (Mdn = 41.44), $U = 1160$, $p = 0.534$.

Levels Achieved: There was also no significant difference in levels achieved between basketball players (Mdn = 14.4) and hockey players (Mdn = 14.4), $U = 1160$, $p = 0.534$.

Interpretation:

The descriptive statistics show that hockey players have slightly higher means for distance covered (752.00 ± 365.00 meters), $VO_2\text{Max}$ ($42.72 \pm 3.07 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$), and levels achieved (14.7 ± 1.29) compared to basketball players, who have means of 689.60 ± 287.15 meters, $42.19 \pm 2.41 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, and 14.5 ± 1.08 , respectively. However, the Mann-Whitney U test results indicate that these differences are not statistically significant, with p-values greater than 0.05 for all variables. This suggests that there is no statistically significant difference in aerobic endurance between basketball players and hockey players as measured by the YYIRTL1 test.

DISCUSSION

The present study aimed to compare the aerobic endurance of competitive basketball and field hockey players using the Yo-Yo Intermittent Recovery Test Level 1 (YYIR1). Our findings showed no statistically significant differences in total distance covered, $VO_2\text{ Max}$, and levels achieved between basketball and field hockey players, suggesting similar aerobic capacities and recovery abilities between these athletes.

The results align with previous studies indicating that the YYIR1 test is an effective tool for measuring aerobic endurance in various sports [1,2]. However, while previous research has primarily focused on single sports, our study contributed to the literature by providing a direct comparison between basketball and field hockey players.

To compare analysis with previous Studies, there was one study compared YYIR1 performance between guards and forwards in basketball, finding no significant differences in distance covered, $VO_2\text{ Max}$, and levels achieved. This similarity in results suggests that the aerobic demands

and capacities required for different playing positions within basketball are comparable to those between different sports such as basketball and field hockey. This further supported the idea that YYIR1's a versatile tool for assessing aerobic fitness across various contexts. [10]

There was one systematic review of YYIR1 test results, found that performance metrics were comparable across different sports. Findings underscored the robustness of the YYIR1 test as a measure of aerobic endurance, regardless of sport-specific demands. This supported our study's results, indicating that basketball and field hockey players have similar aerobic capacities as measured by the YYIR1, and aligns with the broader evidence that YYIR1's a reliable measure across sports. [11]

Another study examined the YYIR1 performance of professional and semi-professional rugby players. They found that professional players performed better than semi-professional players, highlighting the test's ability to distinguish between different levels of play. However, unlike this study, they found significant differences in physiological variables correlating with performance levels. [12]

This difference might be attributed to the varying demands and specificities of rugby compared to basketball and field hockey, suggesting that while the YYIR1 is broadly applicable, the nuances of each sport's physiological demands can influence results.

There was another study on soccer players who observed significant correlations between YYIR1 performance and match performance indicators, such as high-intensity running. Finding had been particularly relevant as it underscored the test's ability to reflect real-world performance in intermittent sports. [7]

While this study did not directly correlate YYIR1 results with in-game performance,

the lack of significant differences between basketball and field hockey players indicates similar demands in terms of intermittent high-intensity activity and recovery, aligning with Buchheit et al.'s findings on soccer players.

There was one study that compared YYIR1 performance between recreational basketball and cricket players and found no significant differences in total distance covered and VO₂ Max. The findings are consistent with our study, suggesting that aerobic capacities are similar across different sports, including cricket and basketball. This study adds to the evidence that YYIR1 is a valid measure for comparing aerobic endurance across various sports, even at the recreational level. [13]

Interpretation and Practical

Implications:

The lack of significant differences in YYIR1 performance between basketball and field hockey players suggests that these athletes have similar aerobic capacities, potentially due to the comparable intermittent nature of both sports. This finding is particularly important for coaches and trainers, as it indicates that conditioning programs focusing on aerobic endurance can be similarly structured for athletes in both sports.

Moreover, the results imply that the YYIR1 test can be a valuable tool for monitoring and developing aerobic endurance in various team sports, irrespective of the specific physical demands and movement patterns. By using a standardized test like the YYIR1, trainers can effectively assess and compare athletes' fitness levels, tailor training programs to address identified weaknesses, and track progress over time.

CONCLUSION

This study adds to the growing body of evidence supporting the utility of the YYIR1 test in evaluating aerobic endurance across different sports. The findings highlight the similar aerobic demands of

basketball and field hockey, suggesting that conditioning programs focusing on high-intensity intermittent activity can be beneficial for athletes in both sports. Future research could explore longitudinal studies to assess how training interventions based on YYIR1 results impact performance and recovery in these sports.

Declaration by Authors

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