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# Comparative Analysis of Aerobic Capacity in Handball and Basketball Players: An Empirical Study Utilizing the Yo-YoIR1 Test

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***Abstract - This empirical study ventured to compare the aerobic capacityof handball and basketball players hailing from LNIPE, NERCE, Guwahati, Assam. In total, 30 subjects participated, evenly split with 15 individuals representing each sport. Aerobic capacity serves as a crucial determinant in assessing an athlete's capability to sustain prolonged physical activity, which is critical in high-intensity sports such as handball and basketball. Utilizing the Yo-YoIR1test, a widely acknowledged method for measuring aerobic capacity, the study aimed to discern any significant disparities in Aerobic capacity between the two groups of players. The findings indicated a notable superiority in aerobic capacity among handball players compared to their basketball counterparts. This difference accentuates the necessity for sport-specific conditioning and training programs to optimize the athletic prowess and performance in diverse sporting disciplines. t-test statistical analysis was utilized, with a 0.05 level of significance.***

***Keywords - Aerobic, Handball, Basketball, Players***

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## INTRODUCTION

The realm of sports science persistently seeks to delve into the intricacies of athletic performance and fitness, with aerobic capacity, or $VO_2$ Max, being a pivotal parameter that underlines an individual's potential to undertake sustained physical activity. Typically gauged through maximal oxygen uptake during exercise, $VO_2$ Max serves as a vital benchmark in discerning the endurance capabilities of athletes (Smith, 2019). In the dynamic and high-octane domains of handball and basketball, where agility and endurance are paramount, a comprehensive understanding of aerobic capacities can provide significant insights into optimizing training programs and improving overall performance.

Both handball and basketball are characterized as high-intensity sports necessitating players to exhibit a harmonious blend of strength, speed, and aerobic endurance (Krustrup & Bangsbo, 2001). Handball players are often subjected to frequent bursts of sprinting interspersed with brief recovery periods, testing their aerobic and anaerobic thresholds (Michalsik, Aagaard, & Madsen, 2015). Meanwhile, basketball players need to maintain a high level of aerobic fitness to endure the prolonged periods of play, characterized by intermittent sprints, jumps, and rapid directional changes (McInnes, Carlson, Jones, & McKenna, 1995).

Given these specific demands and potential disparities in training regimens, this study aims to conduct a comparative analysis of the aerobic capacities of handball and basketball players, thereby shedding light on the variances and possibly influencing future training protocols. Leveraging the Yo-YoIR1 test, a reliable and validated tool for assessing aerobic capacity (Bangsbo, Iaia, & Krustrup, 2008), this research seeks to empirically evaluate the Aerobic Capacity in a cohort of 30 players - 15 each from handball and basketball disciplines hailing from a noted physical education institute.

## METHODOLOGY

### Participants

A total of 30 male handball and basketball players participated in this study, with 15 from each cohort from LNIPE, NERC, Guwahati, Assam. The participants' demographic characteristics are detailed in Table 1.

**Table 1. Demographic Information of Participants**

| | Handball Players | Basketball Players |
|---|---|---|
| Age (years, mean ± SD) | 20.5 ± 1.5 | 21.5 ± 1.5 |
| Height (cm, mean ± SD) | 176.0 ± 6.0 | 179.0 ± 6.0 |
| Weight (kg, mean ± SD) | 78.0 ± 5.0 | 79.0 ± 5.0 |

**PROCEDURE**

The Yo-Yo intermittent recovery 1 test was used to assess the Aerobic capacity of all the participants(Bangsbo et al. 2008).

**I. Pre-test Preparations:**

Participants were informed about the details of the Yo-Yo IR1 test and provided their written informed consent.The required equipment, including cones, measuring tape, Bluetooth speaker with the Yo-Yo test audio, and recording sheets, was prepared.A suitable, flat, non-slippery handball surface at LNIPE, NERC, Guwahati was chosen, free from obstacles. The test area was set up with two cones placed 20 meters apart, with a 5-meter distance marked behind one of the cones for the recovery period(Figure 1).

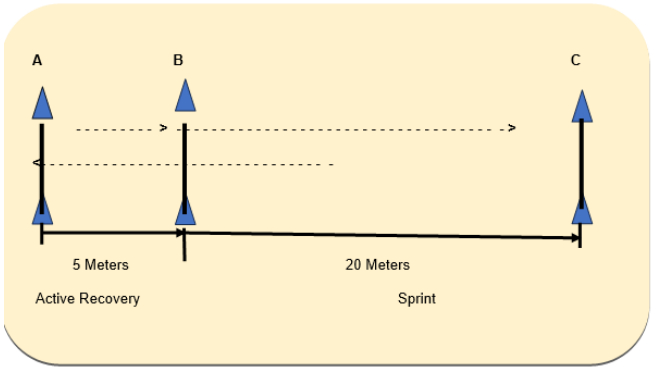


**Figure 1: Yo-Yo intermittent recovery 1 test Track**

**II. Briefing and Warm-up:**

Participants were given an overview of the Yo-Yo IR1 test procedure. A standardized 10–15-minutes warm-up was conducted, including light jogging, dynamic stretches, and short sprints.

**III. Yo-Yo IR1 Test Administration:**

At the start signal, participants ran from one cone to the other (20m) at a pace set by the audio beeps. Upon reaching the second cone, they turned and waited for the next beep. At the next beep, they ran back to the starting cone. After each 40m (back and forth), participants had a 10-second active recovery period during which they walked or jogged around the cone in the 5m recovery area (Figure 1). The speed and frequency of the beeps gradually increased as the test progressed. If participants failed to reach the cone in time with the beep on two consecutive attempts, the test was concluded for that individual.

**IV. Data Collection:**

The last successful shuttle completed by each participant was recorded. The total distance covered by each participant was calculated based on the number of shuttles completed.

The total distance covered by each participant was calculated using the formula:

Distance (Meters) =2×20m×number of shuttles completed.

**V. Post-test Procedures:**

A cool-down routine, including light jogging and static stretching, was provided to all participants.

**Statistical Analysis:**

An independent t-test was used to compare the means of the two groups. The significance level was set at $p<0.05$.

**RESULTS**

**Table 2: Descriptive Statistics of Yo-Yo IR1 Test among Handball and Basketball Plarers**

| t-Test: Two-Sample Assuming Equal Variances | | |
|---|---|---|
| | Yo-Yo IR1 Test | |
| | *Handball Players (Meters)* | *Basketball Players (Meters)* |
| Mean | 1362.67 | 1242.67 |
| Variance | 22963.81 | 15649.52 |
| Observations | 15 | 15 |
| Pooled Variance | 19306.67 | |
| Hypothesized Mean Difference | 0 | |
| df | 28 | |
| t Stat | 2.365 | |
| P(T<=t) two-tail | 0.025 | |
| t Critical two-tail | 2.048 | |

The table no 2: provides the results of a two-sample t-test that assumes equal variances. Mean of Handball Playerson the Yo-Yo Intermittent Recovery Test Level-1 is 1362.67 meters and Basketball Players is 1242.67 meters.From the result, Handball players, on average, ran about 120 meters more than Basketball players in the test.

The calculated t-statistic (2.365) is greater than the critical t-value for the two-tailed test (2.048). The two-tailed p-value of 0.025, which is less than the

conventional 0.05 significance level, reject the null hypothesis. This means there is a statistically significant difference between the mean distances achieved by Handball Players and Basketball Players in the Yo-Yo Intermittent Recovery Test Level-1.

In practical terms, Handball Players, on average, achieved a greater distance than Basketball Players in the Yo-Yo Intermittent Recovery Test Level-1. This difference isn't just due to random sampling variability and is statistically significant at the 0.05 significance level.

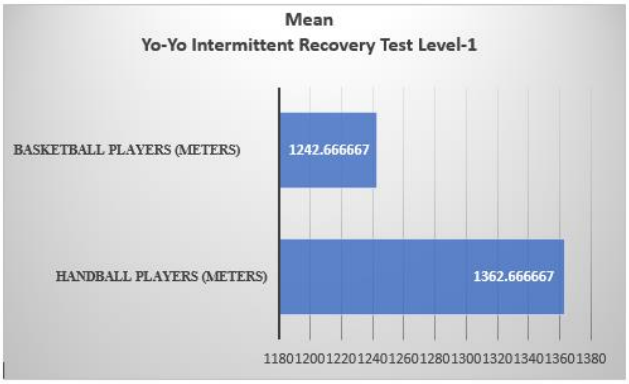


**Figure 2: A bar graph displaying the mean Yo-Yo Intermittent Recovery Test Level-1 values for handball and basketball players in meters.**

## DISCUSSION

The Yo-Yo Intermittent Recovery Test Level-1 has been widely recognized as an effective means to assess an athlete's aerobic capacity and endurance (Krustrup et al., 2003). In this context, the results of our t-test comparing Handball and Basketball players reveal interesting insights.

Handball players, on average, achieved a greater distance (1362.67 meters) than Basketball players (1242.67 meters) in the test. This suggests that the aerobic capacity, as measured by the Yo-Yo Intermittent Recovery Test Level-1, might be higher in Handball players than Basketball players within our sample. Aerobic capacity is crucial in sports that require sustained efforts over prolonged periods, and our findings align with the nature of handball, which demands continuous running, change of directions, jumps, and throws (Michalsik et al., 2015).

Handball matches typically consist of two 30-minutes halves with a 10-minutes break, requiring sustained efforts from the players. Basketball, though also demanding, consists of shorter intervals of play and more frequent breaks, which might not push the aerobic system as intensely as handball (Karcher & Buchheit, 2014).

Furthermore, the variance observed in the results of Handball players was slightly higher than that of Basketball players, hinting that there might be a broader range of aerobic capacities within the Handball group compared to the Basketball group. This could be due to various factors such as different training regimens, positional demands, or individual physiological differences (Gorostiaga et al., 2006).

## CONCLUSION

Based on the conducted t-test, there is a statistically significant difference in the aerobic capacities of Handball and Basketball players, with Handball players demonstrating superior performance in the Yo-Yo Intermittent Recovery Test Level-1. This could be attributed to the inherent demands of handball that might necessitate a higher level of aerobic fitness. However, it's crucial to consider the specific demands and requirements of each sport while interpreting such differences. Future research could delve deeper into the training methods and physiological demands of each sport to provide a comprehensive understanding of the observed differences.

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