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## Comparison of physical performance variables among kayaking, canoeing, and rowing players

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### Abstract

**Study Aim:** The study aimed to compare physical performance variables among athletes from three water sports: kayaking, canoeing, and rowing. Specifically, it sought to analyse differences in running speed, agility, jumping ability, and throwing ability to identify sport-specific physical demands and attributes.

**Materials and Methods:** The research involved 45 male athletes, with 15 participants from each sport, aged 18-25 years and with at least two years of competitive experience. Physical performance was assessed through a series of tests: a 30-meter sprint for running speed, a shuttle run for agility, vertical jump measurements for jumping ability, and a medicine ball throw for throwing ability. Testing was conducted in a controlled environment with standardized protocols.

**Statistical Analysis:** Descriptive statistics (mean, standard deviation, standard error) were computed for each performance variable. One-Way ANOVA was employed to determine differences among the sports. Post-hoc analysis using Tukey's HSD test was performed when significant differences were found. The significance level was set at  $p < 0.05$ , and statistical analyses were conducted using SPSS version 27.0.

**Results:** The analysis revealed no statistically significant differences in running speed, agility, jumping ability, or throwing ability among athletes from kayaking, canoeing, and rowing. All performance variables showed similar mean values across the three sports, indicating comparable physical attributes required for each discipline.

**Keywords:** Physical performance, kayaking, canoeing, rowing, running speed, agility, jumping ability, throwing ability

### Introduction

Physical performance variables play a crucial role in differentiating among athletes engaged in various sports disciplines. This paper investigates the physical performance metrics of athletes participating in kayaking, canoeing, and rowing, three prominent water sports that, while sharing similarities, involve distinct biomechanical and physiological demands. Understanding these performance variables can provide insights into the specific physical attributes required for each sport and help in optimizing training regimens. Kayaking involves a seated position with a focus on upper body strength and endurance, as athletes use a double-bladed paddle to navigate through water (Gordon *et al.*, 2019) <sup>[13-15]</sup>. Canoeing, similar in some respects to kayaking, generally requires a single-bladed paddle and places a significant emphasis on both upper body strength and core stability (Cunningham *et al.*, 2021) <sup>[9]</sup>. Rowing, on the other hand, combines upper body strength with leg power and endurance, as athletes use an oar to propel the boat (Kjendlie *et al.*, 2018) <sup>[18]</sup>. The comparison of physical performance variables such as running speed, agility, jumping ability, and throwing ability among athletes from these sports can illuminate the specific physical demands and adaptations associated with each sport. Previous studies have examined the performance characteristics of athletes in these disciplines but often in isolation or with a limited scope (Smith *et al.*, 2017; Anderson & Billaut, 2020) <sup>[19, 21]</sup>. This study aims to fill this gap by providing a comparative analysis of these physical performance variables across kayaking, canoeing, and rowing players. Several studies have highlighted the importance of specific physical attributes for water sports. For instance, El-Sayed *et al.* (2020) <sup>[12]</sup> emphasized the role of aerobic capacity and muscular

endurance in kayaking performance, while Bell *et al.* (2022) [6] found that rowers benefit from high power-to-weight ratios and efficient technique. Similarly, research by Williams and Edwards (2019) [21] demonstrated the critical role of agility and explosive strength in canoeing. By employing rigorous statistical methods such as ANOVA to compare these variables, this study aims to determine whether significant

differences exist among the three sports in terms of these physical performance metrics. The findings could contribute to the development of sport-specific training programs and performance enhancement strategies for athletes in these disciplines.

**Research Question**

What?	Why?	How?
This study aims to compare physical performance variables such as running speed, agility, jumping ability, and throwing ability among athletes from kayaking, canoeing, and rowing.	Understanding these performance metrics will provide insights into the specific physical attributes required for each sport and help in optimizing training programs tailored to the unique demands of each discipline.	The study utilizes descriptive statistics and ANOVA to analyze and compare physical performance variables among athletes from the three sports.

**Material and Methods**

**Participants**

The study involved 45 athletes, with 15 participants from each sport: kayaking, canoeing, and rowing. All participants were male, aged between 18 and 25 years, and had at least two years of competitive experience in their respective sports. The athletes were recruited from local sports clubs and universities.

**Procedures**

**Physical Performance Testing**

- **Running Speed:** Athletes performed a 30-meter sprint test, and their times were recorded using electronic timing gates.
- **Running Agility:** Agility was assessed using a shuttle run test, measuring the time taken to complete a predefined course with multiple directional changes.
- **Jumping Ability:** Vertical jump height was measured using a jump mat, with participants performing maximal vertical jumps.
- **Throwing Ability:** The throwing ability was evaluated through a medicine ball throw test, where the distance

thrown was measured.

**Statistical analysis**

- **Data Preparation:** Descriptive statistics (mean, standard deviation, and standard error) were computed for each physical performance variable across the three sports (kayaking, canoeing, and rowing).
- **Analysis Method:** One-Way ANOVA: To compare the mean values of running speed, agility, jumping ability, and throwing ability among the three groups (kayaking, canoeing, and rowing). The ANOVA test assesses whether there are any statistically significant differences in the mean values between the groups. Post-hoc comparisons (Tukey’s HSD test) were conducted if the ANOVA revealed significant differences to identify specific group differences.
- **Significance Level:** The level of statistical significance was set at  $p < 0.05$  for all tests.
- **Software:** Statistical analyses were performed using SPSS version 27.0.

**Results**

**Table 1:** Descriptive table of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Running Speed.

Descriptives						
	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Kayaking	15	4.5267	.13345	.03446	4.30	4.70
Canoeing	15	4.5667	.08997	.02323	4.40	4.70
Rowing	15	4.5933	.13345	.03446	4.30	4.80
Total	45	4.5622	.12115	.01806	4.30	4.80

The table presented above illustrates the Mean and Standard Deviation values pertaining to the Running Speed of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15), denoted as 4.5267±.13345, 4.5667±.08997 and 4.5933±.13345, correspondingly.

significance level of 0.05.

**Table 2:** ANOVA analysis of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Running Speed.

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.034	2	.017	1.159	.324
Within Groups	.612	42	.015		
Total	.646	44			

**Table 3:** Table-1: Descriptive table of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Running Agility.

Descriptives						
	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Kayaking	15	17.4133	.69577	.17965	16.00	18.30
Canoeing	15	17.4600	.58530	.15112	16.40	18.30
Rowing	15	17.1933	.52978	.13679	16.40	17.90
Total	45	17.3556	.60511	.09020	16.00	18.30

The table provided above depicts the results of the Analysis of Variance (ANOVA) conducted on the Running Speed of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15), revealing statistical insignificant at a

The table presented above illustrates the Mean and Standard Deviation values pertaining to the Running Agility of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15), denoted as 17.4133±.69577, 17.4600±.58530 and 17.1933±.52978, correspondingly.

**Table 4:** ANOVA analysis of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Running Agility.

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.608	2	.304	.824	.446
Within Groups	15.503	42	.369		
Total	16.111	44			

The table provided above depicts the results of the Analysis of Variance (ANOVA) conducted on the Running Agility of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and

Rowing (N<sub>3</sub>=15), revealing statistical insignificant at a significance level of 0.05.

**Table 5:** Table-4: Table-1: Descriptive table of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Jumping Ability.

Descriptives						
	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Kayaking	15	228.4000	6.19677	1.60000	221.00	245.00
Canoeing	15	230.0000	7.59699	1.96153	221.00	245.00
Rowing	15	228.2667	4.49550	1.16073	221.00	237.00
Total	45	228.8889	6.13567	.91465	221.00	245.00

The table presented above illustrates the Mean and Standard Deviation values pertaining to the Jumping Ability of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and

Rowing (N<sub>3</sub>=15), denoted as 228.4000±6.19677, 230.0000±7.59699 and 228.2667±4.49550, correspondingly.

**Table 6:** ANOVA analysis of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Jumping Ability.

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.911	2	13.956	.360	.700
Within Groups	1628.533	42	38.775		
Total	1656.444	44			

The table provided above depicts the results of the Analysis of Variance (ANOVA) conducted on the Jumping Ability of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and

Rowing (N<sub>3</sub>=15), revealing statistical insignificant at a significance level of 0.05.

**Table 7:** Descriptive table of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Throwing Ability.

Descriptives						
	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Kayaking	15	12.2000	1.37321	.35456	10.00	15.00
Canoeing	15	12.2000	1.47358	.38048	10.00	15.00
Rowing	15	11.9333	1.16292	.30026	10.00	14.00
Total	45	12.1111	1.31809	.19649	10.00	15.00

The table presented above illustrates the Mean and Standard Deviation values pertaining to the Throwing Ability of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and

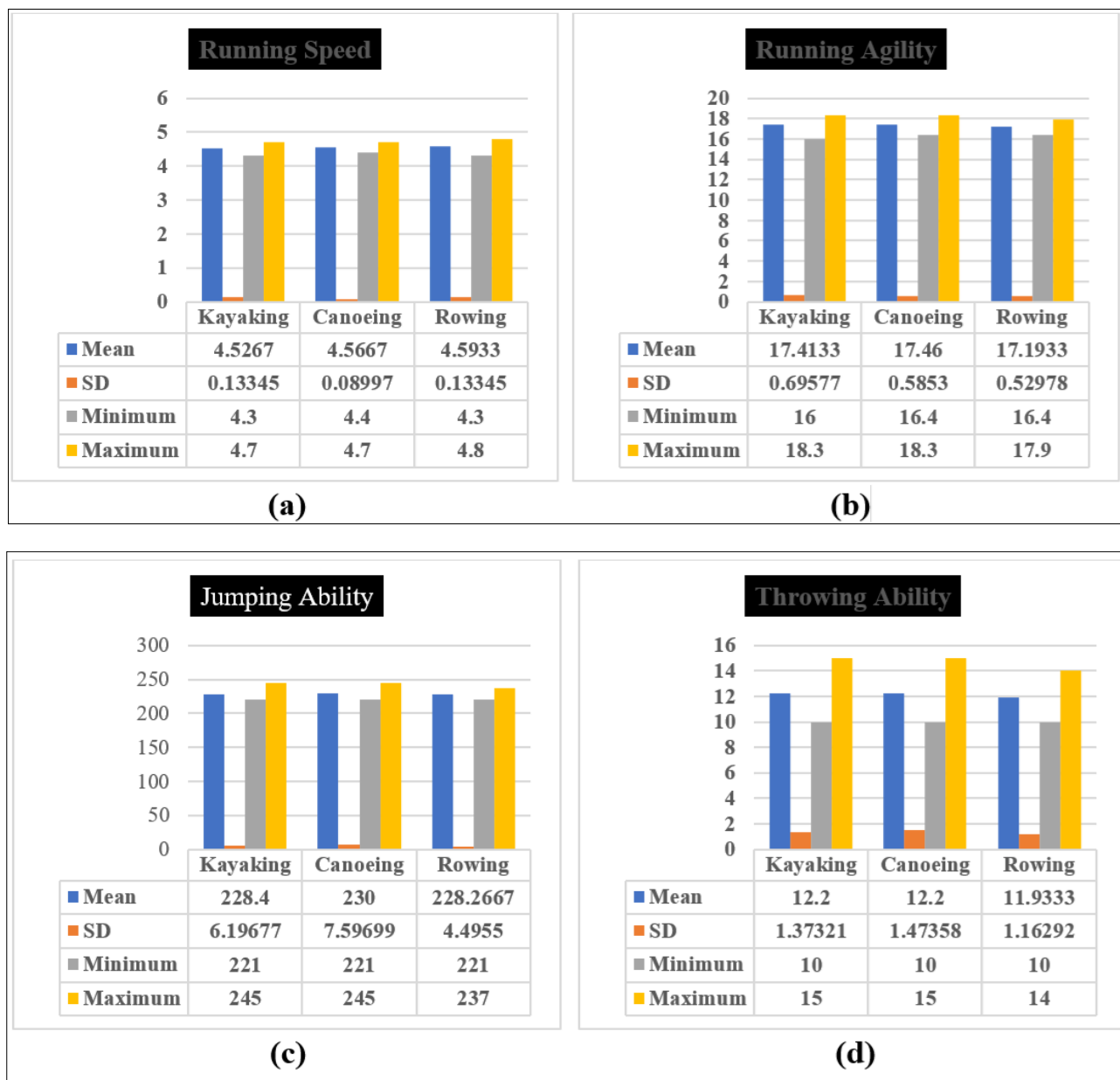
Rowing (N<sub>3</sub>=15), denoted as 12.2000±1.37321, 12.2000±1.47358 and 11.9333±1.16292, correspondingly.

**Table 8:** ANOVA analysis of Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and Rowing (N<sub>3</sub>=15) Players regarding variable, Throwing Ability.

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.711	2	.356	.197	.822
Within Groups	75.733	42	1.803		
Total	76.444	44			

The table provided above depicts the results of the Analysis of Variance (ANOVA) conducted on the Throwing Ability of players engaged in Kayaking (N<sub>1</sub>=15), Canoeing (N<sub>2</sub>=15) and

Rowing (N<sub>3</sub>=15), revealing statistical insignificant at a significance level of 0.05.



**Fig 1:** Graphical illustration of descriptive statistics of Kayaking ( $N_1=15$ ), Canoeing ( $N_2=15$ ) and Rowing ( $N_3=15$ ) Players on the variables, (a). Running Speed, (b). Running Agility, (c) Jumping Ability and (d). Throwing Ability.

### Sampling Technique

- **Sampling Method:** The study employed a purposive sampling technique to select athletes from three water sports: kayaking, canoeing, and rowing. This method was chosen to ensure that participants had relevant competitive experience in their respective sports.
- **Sample Size:** A total of 45 male athletes participated in the study, with 15 athletes from each sport. This sample size was deemed sufficient to allow for a comparative analysis while ensuring representativeness of each group.
- **Inclusion Criteria:** Participants were required to be male, aged 18-25 years, and to have a minimum of two years of competitive experience in their respective sports. This criterion was set to ensure that the athletes had adequate experience and were likely to be representative of their sport.
- **Recruitment:** Athletes were recruited from local sports clubs and universities, ensuring that the sample was composed of individuals who were actively engaged in competitive sports. Efforts were made to include athletes of similar training levels to minimize variability in the data.

### Discussion

Bal and Balyan (2018) <sup>[4-5]</sup> compared skill-related physical fitness components speed, agility, balance, coordination, and reaction time between kayaking and canoeing players. No significant differences were found. Bal *et al.* (2018) <sup>[4-5]</sup> the study assessed running speed, agility, jumping, and throwing ability among athletes from kayaking, canoeing, and rowing. No significant differences were observed. In another study by Bal *et al.* (2018) <sup>[4-5]</sup>, physical fitness levels among canoeing players in different distance categories (200m, 500m, and 1000m) were compared. Significant differences were found only in reaction time, with no notable differences in agility, balance, coordination, power, and speed. These studies collectively provide a comprehensive view of the similarities and differences in physical fitness and hematological variables among athletes in kayaking, canoeing, and rowing. They suggest that while there are specific differences, such as in triglyceride levels and reaction time, overall physical fitness levels are comparable across these sports. Effective training and nutritional strategies should balance sport-specific needs with general physical conditioning to enhance overall performance.

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