



Physical Fitness Demand Of Junior National Waterpolo Players

¹Shraddha Dwivedi

¹Assistant professor

¹Physical education,

¹Degree college of physical education, Amravati, Maharashtra, India

Abstract: The purpose of this study was to evaluate the physical fitness profiles of junior national medalist water-polo team players to better understand the key physical attributes influencing their performance. Water polo is a dynamic, high-intensity sport requiring strength, endurance, agility, and tactical awareness. The performance of players depends heavily on their physical attributes, which play crucial roles in their endurance, speed, power, and recovery. The playing 7 girls of Maharashtra Junior National medalist team were purposively selected as the subject for the study. Their age ranged from 14 to 18 years. The variables selected for the study were Physical fitness variables: back strength, leg strength, leg explosive strength, hand grip strength, flexibility. The data was collected using specified equipment and note down further. Result of the study describe about the min, max, mean, standard deviation, kurtosis, skewness and range of the variables collected. The numerical values analyzed from the statistics shows the nature of the data. The average value of height (162.87 + 5.111), weight (53.12 + 7.989), BMI (20.01 + 2.864), Left forearm strength (27.36 + 2.875), right forearm strength (28.43 + 4.715), flexibility (10.50 + 7.211), back strength (82.78 + 16.709), leg explosive strength (1.62 + 0.177), leg strength (69.56 + 8.575). In conclusion physical fitness profile of junior national water polo players plays a crucial role in their performance and success in the sport. The unique combination of strength, endurance, and tactical skills required for water polo necessitates a specific set of physical attributes and fitness levels. The paper can be used as a reference for low level players to get the idea of peak performance factors which plays crucial role in performance of the water polo game as it was the data from the medalist team of junior national.

Index Terms: physical fitness, endurance, flexibility, strength.

I. INTRODUCTION

Water polo is an aquatic team sport characterized by intermittent bursts of high-intensity activity, requiring athletes to possess a combination of aerobic endurance, muscular power, agility, and explosive strength. Water polo is an intense, dynamic sport that combines swimming, treading water, offensive and defensive strategies⁴, and explosive actions, including jumping, sprinting, and shooting¹. The game requires players to possess a unique blend of physical fitness attributes, such as cardiovascular endurance, muscular strength, anaerobic capacity, agility, and flexibility². As with other water-based sports, players are subjected to the resistance of water, which increases the demand on the cardiovascular and muscular systems. Moreover, the sport's demands vary with positions played⁵, with some requiring more explosive power³ and others focusing on endurance and tactical positioning. Given the increasing competitiveness at junior levels, understanding the physiological and anthropometrical profiles of junior water polo players is vital for creating more effective training programs, enhancing performance, and reducing injury risks. At the junior national level, players are often undergoing significant development, making it essential to understand the specific physical characteristics that contribute to success in this sport. This research aims to provide a detailed physical fitness

profile of junior national water polo players. The study investigates the key physical parameters that distinguish top-performing junior national water-polo players and highlights areas of focus for improving the overall athletic profile of water-polo players⁶ in junior national teams.

Flexibility is important in water polo, especially for movements such as shooting, defending, and treading water. Flexible hips, shoulders, and ankles allow players to maintain a more powerful and efficient body position while moving through the water and executing plays. While this isn't directly an anthropometric characteristic, the ability to sustain physical exertion over the course of a game is often related to an athlete's physical build. A player with a combination of low body fat and lean muscle mass is likely to have better cardiovascular endurance. Water polo is a physically demanding sport requiring strength and agility in water⁹. A high strength-to-weight ratio (lean muscle mass relative to body weight) is important for maintaining endurance and power while performing actions like treading water, swimming fast, and executing strong shots or blocks¹⁰. By observing all these effects of different variables over water polo performance the researcher develops the area of interest.

3.1 Purpose of the study

The main purpose of the study was to form a physical fitness profile of the junior national water polo players.

3.2 Population and Sample

The playing 7 girls of Maharashtra Junior National medalist (bronze medal) team were purposively selected as the subject for the study. Their age ranged from 14 to 18 years.

3.3 Data and Sources of Data

For this study primary data has been collected. The sources of the data (Subjects) belong to the different districts of the Maharashtra state who were supposed to represent Maharashtra team further.

3.4 Selection of variables

The study used pre-specified method for the selection of variables. The selection of variables for the present study were physical fitness variables which includes: back strength, leg strength, leg explosive strength, hand grip strength, flexibility.

3.5 RESEARCH METHODOLOGY

The methodology section outlines the plan and method that how the study is conducted. The details are as follows;

3.5.1 Administration of the test:

- **Body height:** The distance between lower most part of foot and top most part of head. Procedure: The subject stand straight and the researcher measures the distance between the head and the foot. Equipment needed: Stadiometer. Data recorded: Meters/centimetre's.
- **Body weight:** The total amount of mass a body consists. Procedure: The subject stand erect on weighing machine with minimum possible clothes and the researcher note down the reading displayed on the machine. Equipment needed: weighing machine. Data recorded: kilograms.
- **Body mass index:** The calculation done manually by dividing weight with height (m^2). Procedure: Manual calculation. Data recorded: Kg/m^2 .

- **Leg strength test:** Leg dynamometer Test: Measures the maximum force an individual can exert with their legs. Procedure: Using a dynamometer, the individual squeezes as hard as possible. Equipment Needed: Leg dynamometer. Data Recorded: Maximum force (in kilograms or pounds).
- **Leg explosive strength test:** Vertical Jump Test: Measures how high a person can jump from a standing position. Procedure: Use a vertical device or jump mat to measure the maximum height the person can jump. Equipment Needed: vertical or jump mat, measuring tape. Data Recorded: Jump height, typically in inches or centimetres.
- **Back strength:** Measures the maximum force an individual can exert with their back muscles. Procedure: Using a dynamometer, the individual squeezes as hard as possible. Equipment Needed: Back dynamometer. Data Recorded: Maximum force (in kilograms or pounds).
- **Flexibility test:** Sit-and-Reach Test: Measures the flexibility of the lower back and hamstrings. Procedure: Sit with legs extended and feet flat against a box or measuring apparatus, and reach forward as far as possible. Equipment Needed: Sit-and-reach box or standard measuring tape. Data Recorded: Distance reached beyond the toes.
- **Forearm strength test:** Grip Strength Test: Measures the maximum force an individual can exert with their hand and forearm. Procedure: Using a dynamometer, the individual squeezes as hard as possible. Equipment Needed: Handgrip dynamometer. Data Recorded: Maximum force (in kilograms or pounds).

3.5.2 Criterion measure: The following criterion measure has been followed for the data collection process.

Category	Variables	Instruments	Units
Motor Fitness Components	Leg Strength	Leg dynamometer	Kg
	Leg explosive strength	Vertical jump	M
	Back strength	Back dynamometer	Kg
	Flexibility	Sit and reach test	Cm
	Forearm strength	Hand grip dynamometer	Kg

- **Collection of data:** The data was collected from the mentioned players of Maharashtra. First of all, the subjects were instructed about the details of the data collection and purpose of the data collection. The subjects were provided consent form and taken their basic details. It was cleared by the researcher to the subject that their data will remain confidential and will be used just for research work.

3.4 Statistical tools

This section elaborates the proper statistical tools which are being used to forward the study from data towards inferences. Descriptive Statics has been used to find the maximum, minimum, standard deviation, mean and range.

IV. RESULTS AND DISCUSSION

Table 4.1: Results of Descriptive Statics of Study Variables

Variable	Range	Minimum	Maximum	Mean	Std. Deviation
Height	18.00	155.00	173.00	162.87	5.111
Weight	28.00	40.00	68.00	53.12	7.989
BMI	8.79	16.67	25.46	20.01	2.864
Left forearm strength	8.10	22.30	30.40	27.36	2.857
Right forearm strength	15.50	20.40	35.90	28.43	4.715
flexibility	25.00	3.00	22.00	10.50	7.211
Back strength	51.80	63.50	115.30	82.78	16.709
Leg explosive strength	.50	1.50	2.00	1.62	.177
Leg strength	25.00	59.50	84.50	69.56	8.575

BMI: Body mass index, FVC: Forced vital capacity

Discussion on the findings: The statistical terms describe the data very keenly here are the explanation of each of the following statistical method used in the study for different variables.

Height: The height statistics shows that the data ranged from 155cm to 173cm with average (162.87 ± 5.111) which indicates a moderate spread in the height values. Skewness value (0.755, positive) indicating a slight skew to the right (more participants have shorter heights). Kurtosis value (2.363, positive) showing that the data has a higher peak than a normal distribution. The height distribution is slightly skewed towards shorter heights, and the sample has a moderate variation around the mean height.

Weight: The applied statistics on the values of the weight showed that the data ranged from 40kg to 68kg with average of ($53.12 + 7.989$) indicating a fairly large spread in weight. Skewness value (0.377, positive) suggesting a moderate right skew, meaning a few individuals may have higher weights. Kurtosis value (1.821, positive) indicating a moderately peaked distribution compared to a normal curve. The weight data is slightly skewed to the right, with a relatively wide variation in the sample.

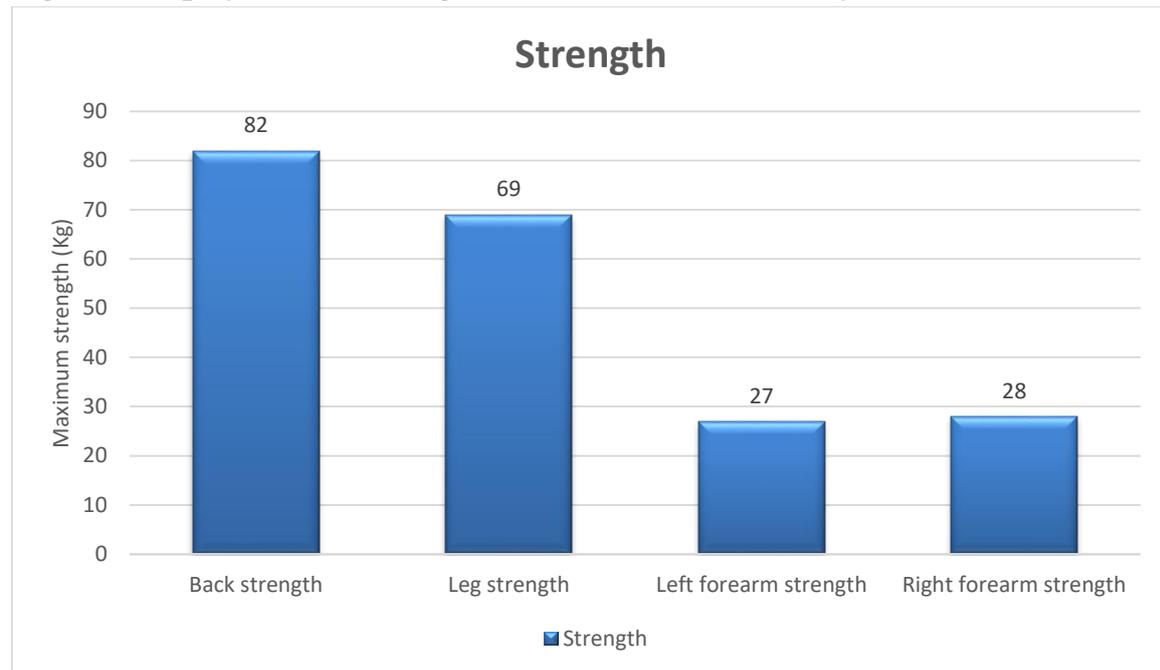
Body mass index: The descriptive statistics of BMI showed that the values ranged from 16.67 to 25.46 with average of (20.01 ± 2.864) showing moderate variability. Skewness values (0.908, positive) indicating a mild skew towards higher BMI values. Kurtosis values (0.673, positive) suggesting that the distribution is somewhat more peaked than normal. The BMI distribution is slightly right-skewed, with a moderate level of variability.

Left forearm strength: The values from the left forearm strength showed that the values ranged from 22.30 to 30.40 with the average of (27.36 ± 2.857) showing a moderate spread. Skewness value (0.896, negative) suggesting a left skew, with most participants having higher strength values. Kurtosis value (0.363, negative) indicating a relatively flat distribution.

Right forearm strength: The statistical analysis of right forearm strength values ranged from 20.40 to 35.90 with the average of (28.43 ± 4.715) indicating a moderate spread. Skewness value 0.023 (very close to 0), suggesting the data is approximately symmetric. Kurtosis value 0.677 (positive), indicating moderate peakedness. Overall analysis concludes that left forearm strength has a negative skew,

meaning most participants have relatively high strength values. Right forearm strength is more symmetric with moderate variability.

Figure1: Display of mean strength of various sites of the body



Back strength: The applied statistics on the raw data of the back strength showed that the values range from 63.50 to 115.30 with average of (82.78 ± 16.709) suggesting high variability. Skewness value (0.998, positive) indicating a mild right skew (more people have lower back strength). Kurtosis value (1.046, positive) indicating a fairly peaked distribution. Back strength has a relatively wide variation with a slight right skew.

Leg strength: The data reveals that the values ranged from 59.50 to 84.50 which shows significant variation, with a 25 kg difference between the minimum and maximum values. The average (69.56 ± 8.575) value with variability is relatively high, indicating substantial variability in leg strength within the sample. Skewness value (0.715, Positive skew) indicates that most of the participants have lower leg strength, with a few individuals showing higher leg strength. Kurtosis value (0.153, Platykurtic) suggests that the distribution is more flattened than a normal distribution, meaning that there are fewer values close to the mean, and the data is spread more evenly across the range. The leg strength data shows a moderate spread with a slight positive skew, indicating that most individuals have lower leg strength, with a few participants having significantly higher values. The distribution is relatively flat, indicating a more even spread of values.

Leg explosive strength: The descriptive statistics of the LES showed that the values range from 1.50 to 2.00 with the average of $(1.62 + 0.177)$ showing low variability. Skewness value (1.628, positive) indicating a strong right skew (more participants have lower explosive strength). Kurtosis value (2.190, positive) indicating a moderately peaked distribution. Leg explosive strength has very little variation and is skewed towards lower strength values in this sample.

Flexibility: The analysed data of the flexibility ranges from -3.00 to 22.00 with the average of (10.50 ± 7.211) indicating a high spread in flexibility values. Skewness value (0.498, negative) showing a slight left skew (more people have higher flexibility) and Kurtosis value (1.611, positive) indicating a relatively peaked distribution. Flexibility values are more spread out, with a slight skew toward better flexibility in the sample.

Conclusion: In conclusion, the physical fitness profile of junior national water polo players plays a crucial role in their performance and success in the sport. The unique combination of strength, endurance, and tactical skills required for water polo necessitates a specific set of physical attributes and fitness levels. This research paper has highlighted the importance of understanding the physical fitness profile of junior national water polo players to optimize their training and performance. Also, the paper can be reference for low level players to get the idea of peak performance factors which players crucial role in performance of the water polo game as it was the data from the medalist team hence it must be referred.

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