

Measurement of Strength and Flexibility Parameters of Badminton Players of Indian Origin: A Normative Data

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ABSTRACT

Badminton is an extremely demanding sport and has emerged significantly in India presently. At an elite level, players are often required to perform at their limits of speed, agility, flexibility, endurance and strength. While many tests are used for measuring aforesaid parameters, field tests are found to be practically more feasible for sports population. Badminton is a sport which requires upper limb strength and flexibility supplemented by agility, speed and flexibility of lower limb along with endurance of the body. Since Indian athlete's normative data is comparatively less available therefore more researches have been focusing on sports data collection.

Methodology: 30 badminton players of Indian origin were randomly selected for examination of their upper extremity and lower extremity strength and flexibility. Subjects who fulfilled the inclusion criteria were included in the study. Four tests were performed by all the selected subjects, sit and reach test, static shoulder flexibility test, standing long jump test, and push up test.

Result: Average shoulder flexibility score obtained was 11.51", standing long jump test score was 1.68m, push up test score was 38.86 while sit and reach test score was 26.08cm for male subjects and for females it was 13.22", 1.56m, 36.66, and 34.75cm respectively.

Conclusion: Hencemale subjects were found with good flexibility and above average strength for upper extremity and under average flexibility and poor muscle strength for lower extremity and whereas, female subjects had excellent flexibility and excellent muscle strength for upper extremity and above average flexibility and below average muscle strength for lower extremity.

Keywords: Badminton; Strength; flexibility; fitness.

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INTRODUCTION

Badminton is an extremely demanding sport. At an elite level, players are often required to perform at their limits of speed, agility, flexibility, endurance and strength. On top of all of this, players must maintain a high state of concentration in order to meet the tactical / mental demands of dealing with their opponents. The varied potential stresses of competitive play are considerable. It is

therefore essential that everyone involved with the modern game ought to be familiar with the fitness (physiological) requirements of the game and how 'Badminton fitness' can be enhanced. Badminton is one of the, fastest games with its, long history spanning more than three thousand years. Badminton refers to a sport that is played with racket in which a shuttlecock is volleyed across a net. World federation define, any person playing badminton, as a badminton player. The game, involves most of the body muscles with the energy, acquired from both aerobic and anaerobic processes. Regular badminton training, enhances physical fitness, especially speed, strength and, aerobic fitness. Badminton also requires a constant, analysis of continuously changing, situation on the court, focusing the player to racket, precisely and quickly, improving his or her assessment and anticipating the next move.¹ It is a sport that is related to strength, rather than strength-limited in that the performance of a player is influenced by strength, and not limited by it. Strength training is best optimised with 3-4 sets of 4-8 repetitions. The recovery between each set should be about 120 sec. Strength training sessions should generally be performed up to three times per week. True strength gains are unlikely unless training is performed at least twice a week. Once a player has become accustomed to performing the strength training movement appropriately, it should be ensured that weights are selected which cause fatigue after the required number of repetitions (in this case between 4 and 8 reps). The subsequent 2 minute recovery should be enough to allow the same (or similar) number of repetitions to be lifted. There are several exercises that target different muscle groups in this sports but ideal training programme should consist of both badminton specific and general exercises. Valuable exercises for badminton would include, Rotator cuff, Seated row, Lunges, Squats, Calf raises, Triceps press, Dumbbell flies It is preferable to use free weights (bars, dumbbells, etc.) as opposed to machine weights as the adaptations to free weight-training exercises are more functional to sporting performance. Correct movement technique is essential for appropriate strength development without injury risk. However, it is beyond the scope of this booklet to instruct on the technique of specific exercises: qualified instructors should be used for this purpose. There is a direct effect on certain muscle groups associated with wrist, elbow shoulders, neck, chest, abdomen, back, thigh, knees and ankles during this game. Muscle power or explosive strength is one such element

and the ability to generate great amount of power is recognized as a primary factor in athletic success.^{2,3} The badminton players use their flexibility to reach, dive and turn to cover all parts of the court. It is an advantage to have an above-average flexibility level of the trunk and shoulder region for sports. The greater flexibility of the stork arms undoubtedly an important factor, as well as hip and hamstring flexibility. Therefore, in badminton, above average flexibility of the shoulder, trunk and hip is expected of players, as flexibility also allows players to perform various strokes efficiently as much retrieval are made with the spine and shoulder joint in hyperextension and with the hips fully flexed by hamstrings when lunge jumps are made at the net. This flexibility allows for more fluent stroking when forced to stretch and facilitates agility on the court.^{4,5,6} There are a number of different situations where flexibility (stretching) work is performed. Stretching should be part of any warm-up and warm-down but stretching should also be performed by Badminton players with a view to promoting long-term increases in joint flexibility. High flexibility is essential in our sport and separate flexibility sessions should be performed regularly in addition to the stretching done as part of a warm-up / down. If flexibility is performed as part of a warm up (and it should be), the aim is to make dynamic movements (i.e., not static stretches) throughout the range of motion for the main joints used in Badminton. This should involve focussing on the joints in the shoulder and lower body. Flexibility should also be used in warm down as this helps to reduce subsequent injury risk. In case, flexibility should involve static stretches where a muscle is stretched to close to its limit. At this point, there should be a very slight pain in the stretched muscle. This point should be held for 20-30 seconds before relaxing and repeating the same stretch 2-3 more times. The body mass index (BMI) or Quetelet index is a value derived from the mass (weight) and height of an individual. The BMI is defined as the body mass divided by the square of the body height, and is universally expressed in units of kg/m^2 , resulting from mass in kilograms and height in metres. The BMI is an attempt to quantify the amount of tissue mass (muscle, fat, and bone) in an individual, and then categorize that person as underweight, normal weight, overweight, or obese based on that value. Commonly accepted BMI ranges are underweight: under $18.5 \text{ kg}/\text{m}^2$, normal weight: 18.5 to 25 , overweight: 25 to 30 , obese: over 30 .^{7,8} The aim of the study was to measure physical fitness parameters of badminton players in Delhi.

METHODOLOGY

A descriptive survey, study design was conducted to determine the physical fitness parameters (BMI, strength, and flexibility) in district level badminton players in Delhi. 30 subjects of age group 14-28 were apprised for the procedure of the study. The subjects who fulfill the inclusion criteria were selected in the study. An appropriate training was given to the investigating team on the operation of equipment and the use of standardized test protocols to ensure that the tests are conducted in a valid and reliable manner. Planned visits were made according to the dates agreed by the stadium authorities. Consent letters were collected and the procedure, purpose of the study was explained to the in-charge, coach and the participating students. All the subjects were familiarized about testing procedure with demonstration of activity if needed. The data collection form were filled by the investigators while athlete performing the tests. Warm up and stretching exercises were done 15 min before starting the test procedure. Age, Height & weight were recorded followed by sit and reach test, shoulder flexibility test, push up test, and standing long jump test were perform. Three trials were recorded for sit and reach test, standing long jump test, and shoulder flexibility test followed by taking their average for statistical analysis.

RESULTS

Results of the present study indicates that average shoulder flexibility of professional badminton players was 11.51" which tends to fall under good category. Standing long jump test score was 1.68m which tends to fall under poor category. Push up test score was 38.86 which tends to fall under above average category. Sit and reach test score was 26.08cm which tends to fall under average category for male badminton players. For female badminton players average shoulder flexibility was 13.22" which tends to fall under excellent category. Average standing long jump test score was 1.56m which tends to fall under below average category. Average push up test score was 36.66 which tends to fall under excellent category. Average sit and reach test score of professional badminton players was 34.75cm which tends to fall under above average category.

Table 4.1: Demographic data table(female)

Variable measured	N=Total subjects	Mean	Standard Deviation
Age	6	16.16	0.40
Height	6	1.57	0.06
Weight	6	49.16	4.79
BMI	6	17.42	2.58

Table 4.2: Physical fitness test scores (females)

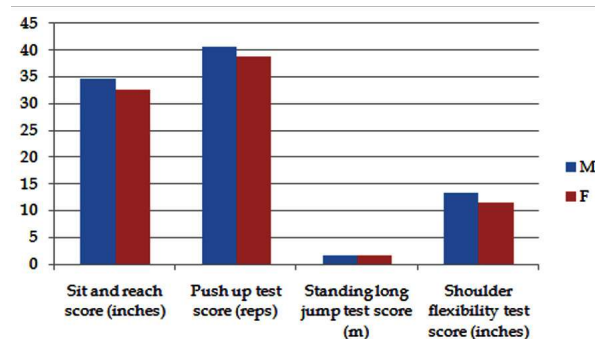
Variable measured	N	Mean	Standard Deviation
Sit and reach score (inches)	6	34.75	9.80
Push up test score (reps)	6	40.66	13.54
Standing long jump test score (m)	6	1.56	0.17
Shoulder flexibility test score (cm)	6	13.22	2.28

Table 4.3: Demographic data table (male)

Variable measured	N=Total subjects	Mean	Standard deviation
Age	24	18.71	3.07
Height	24	1.71	0.07
Weight	24	59.08	9.57
BMI	24	16.15	2.75

Table 4.4: Physical fitness test scores (male)

	N	Mean	Standard Deviation
Sit and reach score (inches)	24	32.60	7.71
Push up test score (reps)	24	38.86	12.18
Standing long jump test score (m)	24	1.68	0.37
Shoulder flexibility test score (cm)	24	11.51	3.05



Graph 4.1: Graphical representation of male and female fitness test scores.

DISCUSSION

Badminton is a sport requiring high strength and flexibility. Indian athlete's physical fitness variables

normative data for different sports is scarcely available. Therefore in present study 30 professional badminton players were included for research. Appropriate training was given to the investigator on the operation of equipment and the use of standardized test protocols to ensure that the tests are conducted in a valid and reliable manner. Results of the present study indicate that average shoulder flexibility of professional badminton players was found to be 11.51 inches which tends to fall under good category, the average standing long jump test score of professional badminton players was found to be 1.68m which tends to fall under poor category, the average push up test score of professional badminton players was found to be 38.86 which tends to fall under above average category, the average sit and reach test score of professional badminton players was found to be 26.08cm which tends to fall under average category. In the female results of the present study indicates that average shoulder flexibility of professional badminton players was found to be 13.22 inches' which tends to fall under excellent category, the average standing long jump test score of professional badminton players was found to be 1.56m which tends to fall under below average category, the average push up test score of professional badminton players was found to be 36.66 which tends to fall under excellent category, the average sit and reach test score of professional badminton players was found to be 34.75cm which tends to fall under above average category. Given the potential benefits of fitness testing, the Committee on Fitness Measures and Health Outcomes in Youth Russell Pate, Maria Oria, and Laura Pillsbury, et al, Food and Nutrition Board, Washington DC, national academic press, in 2012 recommends the use of Push-up for Upper-body strength, Vertical Jump for explosive power, lower-body strength and athletic ability are some measures that should be used in schools (and other educational settings) even though the evidence for their relationship with health is only promising

at this time. The committee recommends these additional measures with the expectation that future research will elucidate whether they are related to health in youth.

CONCLUSION

From the present study we conclude that male subjects have good flexibility and above average strength for upper extremity and under average flexibility and poor muscle strength for lower extremity and Female subjects have excellent flexibility and excellent muscle strength for upper extremity and above average flexibility and below average muscle strength for lower extremity.

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