

# The Relation Between Agility, Jumping Ability and Sports Performance in Professional Badminton Players

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## Abstract

The study aimed to determine the correlation between agility, jumping ability and sports performance of professional badminton players. To accomplish the goal of this study fifty-one (51) professional badminton players between age fifteen to thirty (15-30 years) were chosen. The hexagonal agility test was used for measuring agility, vertical jump test for the jumping ability and accuracy test for the sports performance. The results of this study showed that there is a weak, negative correlation ( $r=-0.06$ ) between agility and jumping ability, the jumping ability and sports performance had a positive but weak correlation ( $r=0.02$ ) and the agility and sports performance showed negative and weak correlation ( $r=-1.64$ ). It is a highly statistically significant study ( $P=0.01$ ). Thus, this study concludes that there are no correlations between these three qualities of badminton players so if any one quality is degraded it won't affect the other two qualities.

**Keywords:** Badminton, agility, jump, sports performance.

## Introduction

Badminton is a racket sport. It is played with two or four players with a temporal structure characterized by actions of short duration and high intensity. It can be played in five events: men's single, women's single, men's double, women's double, mixed.

It was included in Olympics Games in 1992. Badminton is often played as an outdoor activity sport in a yard or on a beach but formal matches are played on a rectangular indoor court. Points are scored by striking the shuttlecock with the racquet and leading it within the other team's half of court.

The game developed in British India from earlier game of battledore and shuttlecock. This sport is highly demanding with an average heart rate over 90% of players maximum heart rate. The intermittent actions involved in the game are demanding both aerobic and anaerobic systems: 60% - 70% aerobic system and 30% anaerobic system with greater demand on aerobic lactic metabolism with respect to anaerobic lactic metabolism.

There is a typical trajectory that the shuttlecock follows and for it the players perform various movements like lunges, jumping and powerful strokes using a specific pattern of movement. All the badminton players are visually fit to pick up accurate visual input and process it in short time for their victory.

Badminton not only has a strong entertainment component but also has a good physical exercise component. At high levels of play the sport requires excellent fitness: the player requires aerobic stamina

agility, strength, speed and precision. It is also a technical sport, requiring good motor coordination and development of sophisticated racquet movements.

Sports are any form of competitive physical activity or game that aims to use, maintain or improve physical ability and skills while providing enjoyment to participants and entertainment. Badminton is a popular sport worldwide. It is one of the most played sports in India. It is played using a shuttlecock and a racket. It is having the fastest racket stroke called as “SMASH”. The speed of smash as high as 30m/s. <sup>[1][2]</sup> The length of the badminton court is 44feet (13.41m) and the breadth is 20feet (6.1m). The total area of the badminton court is 81.801sqm.

Badminton demands complex movement patterns which is unique as compared to other sports. This complexity and very high demands need excellent fitness; which may also lead to injury. It is a combination of both aerobic and anaerobic fitness. The players start from serving the shuttlecock to the target area so accuracy is very important.

Lunges are the movements performed frequently in the game. Good lunges steps require high flexibility. The players have to move rapidly in multiple directions, jump with a good power and have agile foot work therefore the players need to have good range of motion (ROM), power, agility, jumping ability. The players need to adjust their positions and sprint as well. While sprinting the COG and BOS changes due to which maintaining balance is necessary. <sup>[1][3]</sup> Maintaining balance is also important to maintain sports injuries. <sup>[1][4][5]</sup> Agile footwork like ability to change directions over short distance is important in both defending and attacking. <sup>[6][7]</sup>

Hand-eye coordination is coordinated control of eye and hand movements processing the visual input in CNS to guide reaching and grasping along with the use of proprioception of hand to guide the eyes. <sup>[8]</sup> So badminton is a sport which requires many qualities.

Badminton requires specific technical skills with a number of physical components. In this regard there is a combined development of strength, power, agility, speed, hand-eye coordination and balancing skills as pre-requisite success in badminton. To make the training skills better and check the training loads it is essential to assess the badminton players regularly using some reliable and valid tests so that they can be trained accordingly. Consistent evaluation will provide the coaches and the trainers some useful information regarding the qualities which needs to be trained more and that can add a good value in the training prescription. After implementing such good individualised training strategies, regular evaluation to check whether the training strategies worked or not and then replanning the strategies accordingly can help the player to perform at the best level.

Vertical jump involves rapid movement of the body involving multiple times change in direction and velocity thus the players require good sprinting ability and muscle power. The trajectory motion of the shuttlecock demands skills to give a good shot like good agility, balance, vertical jumps, postural changes to give a successful strike to the shuttlecock. Agility and vertical jump are therefore the most important qualities required by the badminton player.

## Methodology

### Research design

This study is a cross-sectional study to find the correlation between agility, jumping ability and sports performance in professional badminton players. The study used quantitative approach and it involved measuring the three qualities using hexagonal agility test, vertical jump test and accuracy test. This study

aimed to find out if there is any correlation between agility jumping ability and sports performance so to see if any one of the qualities is degraded will it affect the other two qualities or not.

### **Subjects**

The subjects of the study were 48 professional badminton players from badminton courts of Pune, Maharashtra with age between 15-30 years both male and female with 2 or more years of experience. Any subject with complaint of pain or with comorbidity and having any visual or balance disturbance was excluded from this study.

### **Outcome measure**

#### **Subject orientation**

Before starting with the tests several meetings with the subjects were conducted and all the subjects were given a clear explanation of the goals and intent of the research. They were provided with a thorough explanation of the testing process. They were asked to assist and take an active part in the same and were also provided with a consent form which included the title of the study, the aims of the study, and assurance to the subjects that their information would remain confidential

All tests were demonstrated after completion to ensure that the subjects understood what was expected of them. The formal consent from the college principal was obtained to carry out the training program.

#### **Hexagonal test for agility**

Using a, tape a hexagon with each side of 24inches (60.5cm) in length and each angle of 120 degrees is drawn on the ground. Prior to the test make the subject perform a standard warm-up. The subject begins with both feet together in the middle of the hexagon facing the frontline. On “GO” command they jump ahead across the line and then back over the same line into the middle of the hexagon. Continue this pattern for 3 full revolutions. The score time is taken from the best of 3 trials

#### **Vertical jump test**

Ask the subject to perform warm up for prior to the test. The subject chalks the end of their fingertips. He stands on the side of the wall, keeping both feet on ground reaches up as high as possible with 1 hand and marks the wall with the tip of finger (M1) Then he jumps as high as possible and then marks the wall with the fingertip (M2). The assistant records the distance between M1 and M2. Repeat the test 3 times and note down the best performance record.

#### **Accuracy test**

As subjects are required to perform a serve with a distance of not less than 396cm to start the game the travelling distance of the shuttlecock and accuracy of the serve is critical indicator of sports performance. In study the badminton performance was quantified by the number of times a shuttlecock fell in a designated area on floor (400-420cm away from, the starting position) following a badminton serve. Each subject was given the same badminton racket and 10 shuttlecocks. Then the subject stood on the starting point and performed 10 serves towards the target area (400-420cm away). The number of times the shuttlecock fell in the target area was recorded and used for accuracy.

**Statistical analysis**

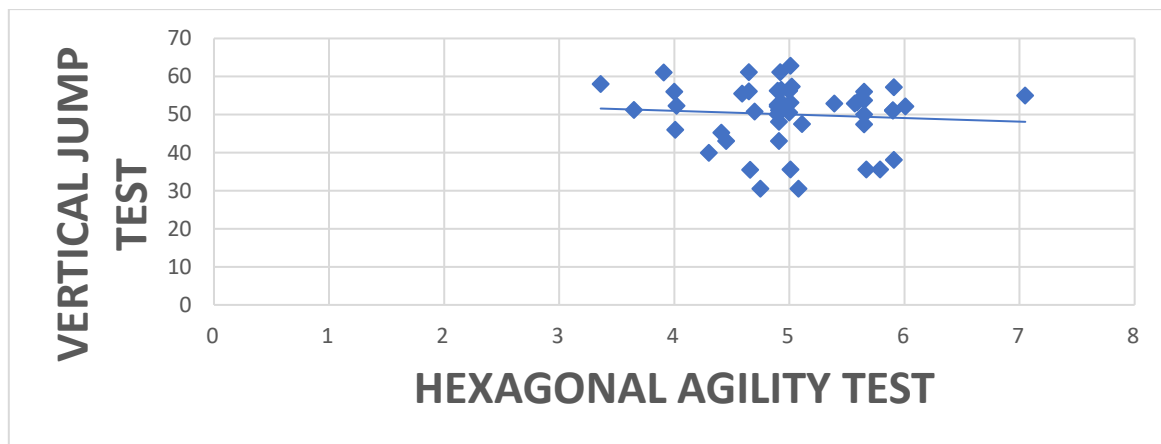
Paired t-test was used to analyse the data.

Pearson’s correlation was used to analyse the association between agility, vertical jump and sports performance.

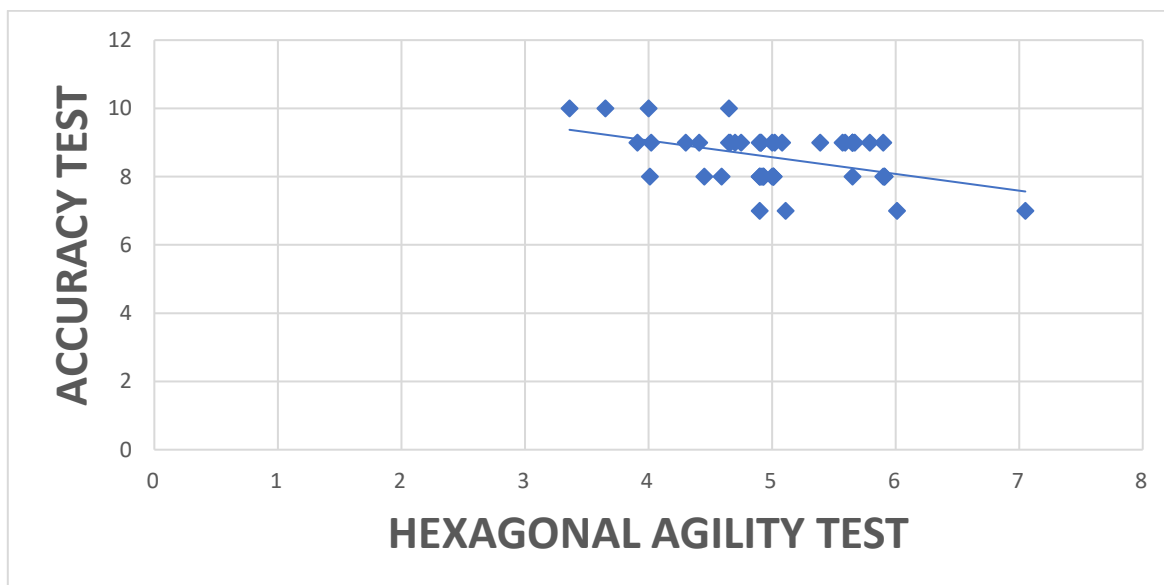
**Results**

48 subjects participated in the study out of which there were 37 males and 11 females. 5 people had left hand dominant rest 43 subjects were right hand dominant. 22 subjects were district level players, 21 subjects were state level players and 5 were national level players.

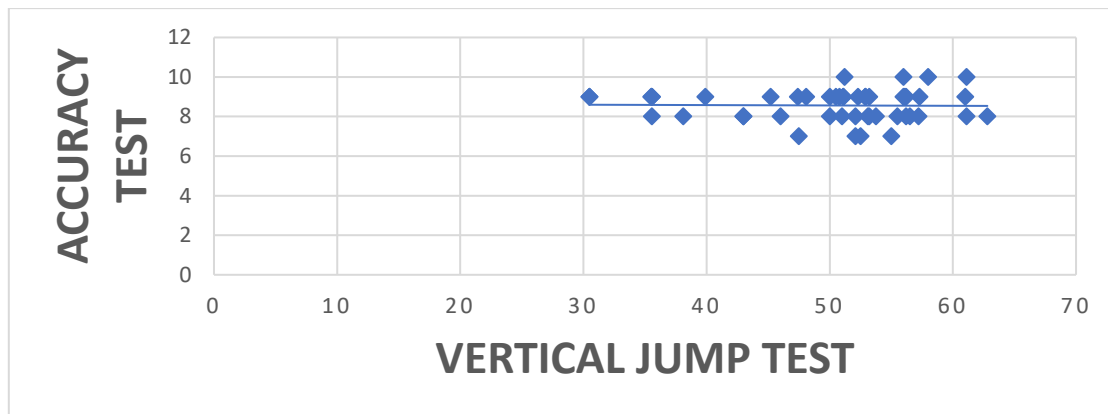
Variable	mean+_ SD
Age	19.35+_ 3.68
Years of experience	4.44+_ 1.96



**GRAPH 1 shows that there is negative correlation of -0.0629401 between hexagonal agility test and vertical jump test.**



**GRAPH 2 shows there is negative correlation of -1.64059033 between hexagonal and accuracy test**



**GRAPH 3 shows there is positive correlation of 0.01622668 between vertical jump and accuracy test**

### Discussion

The purpose of the study is to assess the correlation between agility, jumping ability and sports performance of professional badminton player. As a professional badminton player has to move quickly in multiple direction good agility training is necessary for them which can be trained by shuttle run, plyometrics, L drills, etc.

For agility hexagonal test was used to assess the players. With agility the player has to balance every time the player changes the direction therefore, they require a good control, stability and strength in their limbs. Smash is a shot where the player hits the shuttle with power and speed in downward direction in opponent’s court. While giving a smash the player jumps which allows him to hit the shuttle with high speed and a steeper downward angle. The jumping ability is thus necessary and is assessed using the vertical jump test. The sports performance was scored by the number of shots the player aimed in the mark. Thus, to find out that if any 1 ability is lost is the other affected, the study is to find out correlation between them.

It is very important that all tests used in the study are highly reliable due to practical impact of fitness (e.g. returning to sports after injury, planning for rehabilitation, training prescription, etc). The hexagonal tests showed the most reliability of 0.88.

All the participants were adherent to this study throughout. Different badminton sport clubs in Pune were approached. The sample size was 51 out of which 48 participated voluntarily according to the inclusion criteria.

Hexagonal agility test: the outcome for this test is taken in seconds and then the players are categorised into excellent, above average, average, below average and poor. The lesser seconds required to complete the hexagon the more agile is the player. The graph 6 shows results of hexagonal agility test that all the 48 players (37 male and 11 females) completed the hexagon in less than 12 secs and stood in the excellent category. This shows players are agile enough to

Vertical jump test: the outcome for this test is taken in centimetres and then the players are categorised into excellent, above average, average, below average and poor. The greater the difference between two marks the greater is the score. Graph 7 shows their results. In this test no players stood in the excellent category, 21 players (15 males and 6 females) performed above average, 18 players (14 males and 4 females) had an average performance, 6 male players performed below average and 3 players (2males and 1 female) were poor in their performance. This discrepancy might be due to difference in squatting

amongst the players, difference in sample number, age, gender, maturation status, years of experience, level of sports game played.

Accuracy test: in this test the player had to aim and shoot the shuttle In the given mark this helped to assess the performance of the player. graph 8 shows the results that 4 players (3 males and 1 female) aimed 7 shots, 17 players (12 males and 1 female) could aim 8 shots, 23 players (18 males and 5 females) aimed 9 shots and 4 male players aimed 10 shots in the circle.

The lesser seconds required to complete the hexagon, the greater distance between 2 points in vertical jump and greater the shots aimed in the mark the more they are correlated.

On contrary to authors hypothesis (Paule et al. 2000) we found no significant correlation between hexagonal and vertical jump test. Graph 1 shows that we found a negative correlation of -0.062 between these tests. The discrepancy might be due to some difference in sample number, age, gender, maturation status, years of experience, level of sports game played.

Graph 2 shows that we found a negative correlation of  $r = -1.62$  in between hexagonal and accuracy test.

Graph 3 shows that Low correlation is found between the vertical jump and accuracy test of  $r = 0.016$ .

The t-test value is 15.053 and the t-test table value is 2.62

The p value is  $0.01 = 1\%$

Thus, we can say that there is no correlation between these three tests so if any one quality is degraded it won't affect the sports performance of the player. All the qualities affected must be trained individually irrespective of the other.

### **Limitations**

The research presents several limitations which makes it impossible to make any proper conclusions from the outcomes we received from the data collected. The study is limited by small sample size of 48 professional badminton players including both the genders from Pune; hence our results cannot be extrapolated to more specifications (e.g. Only national level or state level badminton players). The training, age, experience level, years of experience maturation status were variable for all the players which gives us a certain level of heterogeneity in the samples collected and may affect the outcomes. Further investigations considering all these different aspects can be looked after to make firm conclusions on the correlation between the tests.

### **Conclusion**

The study concluded that there is negative correlation between agility, sports performance and jumping ability. All the three qualities require different training process. A possible reason could be players are focusing on agility training and not working on their jumping training.

### **Future scope**

Further studies can be done using more specific and advanced devices like electronic hexagonal obstacle test, jumping mats, etc. In addition, correlation of other variables like hand-eye coordination, balance, coordination, flexibility should be done.

### **Acknowledgement**

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