



Effect of selected Physical Fitness Components on Volley-Ball players in spiking performance at various Atmospheric Conditions

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Abstract

Performance in games and sports depends upon factors of physical fitness such as speed, strength, flexibility and endurance. Fitness factors are more important to predict the performance of any athlete. The game of volleyball comprises skills such as setting, serving and spiking. The technique of spiking involves utilizing a combination of speed and strength to hit the ball. The main purpose of this study is to examine the influence of selected physical fitness components at different temperatures for spiking. Ten collegiate level male Volleyball players of VITAM College of engineering, Visakhapatnam, participated in this study as subjects and they have undergone in speed and explosive strength training for seven days. The subjects were selected in the age group of 18-21. The collected data was analyzed by using t-test. The findings of this study revealed that there is a significant difference in speed and explosive strength after training.

Keywords: Physical fitness, components, spiking volleyball, speed, explosive shoulder strength, leg strength.

Introduction

Physical fitness makes life enjoyable and enables the reach of goals with the least fatigue or stress. It is the combination of speed, strength, flexibility, endurance and coordinative abilities.

Sports contribute to physical fitness through intensive training provided for competition. Fitness factors predict the performance levels of any athlete. There are a number of pre-requisites for optimum performance. Some of the factors are physiological, environmental, psychological and sociological etc. This paper focuses on environmental factors. Temperature plays a vital role in the performance of a player.

A set of skills and techniques are needed in the game of Volleyball in order to become proficient in this game. Setting, passing, serving and spiking are such skills. In this paper the focus is on the technique of spiking and the consequent development of this skill to enable solid offense to support the central attack. Spiking involves a combination of speed and strength to strike the ball. In this technique, the player can gain an advantage by taking the opponent by surprise with increased amount of force as well as the advantage of height when the player jumps into the air to spike the ball if the opposing team does not block in time.

William G. Morgan was instrumental in inventing the game of Volleyball for the enjoyment of businessmen. Initially the game was played with the basket ball bladder. They used 6 feet 6 inch height tennis net and they used to throw the ball over the net. At that time the game was called mintonette.

Later on they introduced rules and regulations, special court, players, points etc. Dr. T.A Halsted of Springfield College of USA christened the game as Volleyball. Volleyball is major game in over 180 countries. Volleyball came to India along with YMCA movement.

Statement of the problem: Spiking in Volleyball depends upon factors such as speed, explosive strength and atmospheric conditions. The object of this study is to assess the impact of selected physical fitness components and different atmospheric temperatures.

Delimitations: This study is restricted to collegiate level boys and selected physical fitness variables. The subjects were selected in the age group of 18-21. This study pertains to performance in summer season only.

Limitations: The life style and family factors could not be controlled. The study is conducted in the open field and not under laboratory conditions.

Hypothesis: For Speed: H₀: There is no significant difference between pre and post training at different atmospheric temperatures in the speed of players

For Explosive strength H₀: There is no significant difference between pre and post training at different atmospheric temperatures in the explosive strength of players.

Definition of the Terms: Speed: The capacity to move a limb or part of the body or whole body with the greatest possible velocity.

Explosive strength: Explosive strength is a combination of strength and speed abilities. It can be defined as the ability to overcome resistance with high speed.

Spiking: A front zone player hitting the ball forcefully over the net is called spiking. It is also termed as hitting or attacking. Spiking is the most critical component of all actions of Volleyball. Proper timing of the jump and swing of arm are needed to have perfect spike.

Significance of the study: i. This study could be helpful to players, coaches to measure optimal performance levels at the right time. ii. Demonstrates how the physical fitness variables and atmospheric temperatures influence skill enhancement. iii. Adds knowledge to the areas of research. iv. Helps the researcher to assess the best time to perform the activity.

Review of Literature: There are different factors which are correlated with the velocity of a volleyball spike¹. The effect of spike is a determining element in the optimum performance of a Volleyball player. This paper proposes that certain muscular and physical features impact the speed of the ball while spiking.

The goals of this study include estimate of is kinetic strength of the strong shoulder and elbow of skilled volleyball players by laying an equation among the physical features and speed of the spike. Hence in this paper certain spike attacks such as running succeeded by upward jump are discussed. This method enables the spiker to generate momentum laterally and afterwards upwardly. The results of this investigation prove that increase in the force of internal rotator can improve the speed of the ball while spiking. The first division players too benefited from intensive training of muscle strength than did the second division players. There was a significant correlation found between the velocity of the ball and the impact of height which had to be determined by the analysis of the filmed actions. The first division league athletes exceeded the second division athletes in the jump tests. A critical association was shown between the momentum of the spike and body mass index of the players. Hefty players exhibited enhanced efficiency in tandem with their height during spiking.

The coordination of body segments during a spike and the mid air spike are discussed in one of the earlier studies. It is mentioned in various reviews that biomechanics is involved with different aspects of over head spike². In this study skilled volleyball players are found to have an improved area of motion while moving their arm during hitting than intermediate athletes when spiking. In the paper it is stated that "enough range of motion before ball hitting is the main factor affecting power in the spiking technique". A beginner makes a major flaw in spiking when their jump is on the down side. "Elite level players were shown to perform the three phases of hitting (back-swing, turn-swing, and forward-swing) as soon as possible in the jumping phase". In this review the actions of

the body during a spike involving the right elbow joint and right knee joint as a the coordination of reactions was discussed. These were not observed in the second level athletes which clearly demonstrates that proper time-distribution of "back-swing, turn-swing, and forward-swing causes the proper timing of ball hitting".

In the Guide to Spiking³ in Volleyball for the beginners it is stressed that mastery of the attack approach is critical to spiking. The approach can be defined as "a systematic method for traveling from a player's starting point to the ball". The object of the approach is to optimize the best position to attack the ball. Even though the attack sequence is player centric, the final steps are unchanged. The aim of the hops is to upgrade horizontal thrust of the players.

In hitting and attacking the ball the right kind of footwork helps the player to garner huge amount of power and exactness in placing the shot⁴.

Methodology

Ten players are taken as subjects and they have undergone training for seven days in the morning session in acceleration of speed (50 yards dash) for 10 times with rests in between. They are training in Basketball throw for 10 times with rests in between to enhance explosive shoulder strength and standing broad jump for 10 times in two parts to boost the strength of legs is given.

After this training 10 male players of collegiate level aged 18-21 participated in spiking skill of volley ball in the morning session at 7.00 am and in the afternoon session at 2.00 pm. Long jump pit is utilized for standing broad jump for which assistance of three students is taken.

Results and Discussion

Analysis of the data and results of the study: The object of the study is to examine the influence of different atmospheric temperatures on selected physical fitness components for spiking in volley ball. Data is obtained from 10 collegiate male volleyball players of VITAM College of Engineering, Visakhapatnam.

Speed: In the pre-training stage players took 1.8 sec. to 2.0 sec. time from attack line to net (3 mtrs distance) to reach the ball to spike in the morning session at 7.00 am at 26⁰ C. In the afternoon session at 2.00 pm at 36⁰ C. Players took 1.9 sec to 2.1 sec. time to reach the ball to spike due to hot temperature.

In the post-training period players took 1.7 sec to 1.9 sec time to reach the ball to spike in the morning session at 7.00 am. at 27⁰C. In the afternoon session at 2.00 pm at 37⁰ C. players took 1.9 sec. to 2.00sec time to reach the ball to spike due to hot temperature.

Explosive Shoulder and Legs Strength: In the pre- training stage 5 out of 10 players only spiked the ball over the net height of 2.43 mtrs at 7.00 am at 26⁰C in the morning session. But in post training stage all the 10 players could hit the ball over the net on account of the training.

In the post-training phase 6 out of 10 players spiked the ball over the net height of 2.43 mtrs at 7.00 am. at 26⁰C in the morning session. After training all the 10 players could hit the ball over the net.

Table-1

t- test – Speed (Spiking the ball) (Morning session)

| Pre- training (x) in sec. | Post- training (y) in sec. | d= (y-x) | d ² |
|---------------------------|----------------------------|----------|----------------|
| 1.9 | 1.7 | -0.2 | 0.04 |
| 1.8 | 1.8 | 0 | 0 |
| 1.8 | 1.7 | -0.1 | 0.01 |
| 1.9 | 1.8 | -0.1 | 0.01 |
| 2.0 | 1.9 | -0.1 | 0.01 |
| 1.9 | 1.8 | -0.1 | 0.01 |
| 1.9 | 1.8 | -0.1 | 0.01 |
| 1.9 | 1.8 | -0.1 | 0.01 |
| 1.8 | 1.8 | 0 | 0 |
| 2.0 | 1.9 | -0.1 | 0.01 |
| Total | | -0.9 | 0.11 |

$$t = \frac{\bar{d}}{s/\sqrt{n}} \text{ where } \bar{d} = \frac{\sum d_i}{n} = \frac{-0.9}{10} = -0.09$$

$$s = \sqrt{\frac{\sum d^2 - n(\bar{d})^2}{n-1}} = \sqrt{\frac{0.11 - 10(-0.09)^2}{10-1}} = \sqrt{\frac{0.11 - 0.081}{9}} = 0.057$$

$$\therefore t = \frac{-0.09}{0.057/\sqrt{10}} = \frac{-0.09 \times \sqrt{10}}{0.057} = -4.99$$

$\therefore |t| = 4.99$
tabulated t.tab = t (α, d. o. f) t 0.05, (10-1) d. o. f = t.tab = 1.83
 $\therefore t. cal . 4.99 > t.tab 1.83$

we reject H₀; Hence it is concluded that there is a significant difference in speed between pre and post training.

Table-1 (A)

t- test – Speed (Spiking the ball) (Afternoon session)

| Pre-training (x) in sec. | Post- training (y) in sec. | d= (y-x) | d ² |
|--------------------------|----------------------------|----------|----------------|
| 2.0 | 2.0 | 0 | 0 |
| 1.9 | 1.9 | 0 | 0 |
| 1.9 | 1.9 | 0 | 0 |
| 2.0 | 1.9 | -0.1 | 0.01 |
| 2.1 | 1.9 | -0.2 | 0.04 |
| 2.1 | 2.0 | -0.1 | 0.01 |
| 2.1 | 2.0 | -0.1 | 0.01 |
| 2.0 | 1.9 | -0.1 | 0.01 |
| 2.0 | 1.9 | -0.1 | 0.01 |
| 2.0 | 2.0 | 0 | 0 |
| Total | | -0.7 | 0.09 |

$$t = \frac{\bar{d}}{s/\sqrt{n}} \text{ where } \bar{d} = \frac{\sum d_i}{n} = \frac{-0.7}{10} = -0.07$$

$$s = \sqrt{\frac{\sum d^2 - n(\bar{d})^2}{n-1}} = \sqrt{\frac{0.09 - 10(-0.07)^2}{10-1}} = \sqrt{\frac{0.09 - 0.049}{9}} = 0.067$$

$$t = \frac{-0.07}{0.067/\sqrt{10}} = \frac{-0.07 \times \sqrt{10}}{0.067} = -3.303$$

$\therefore |t| = 3.303, t.cal = 3.303$
t.tab = t α (n-1) d. o. f = t 0.005, (10-1) d. o. f = 1.83
t.cal 3.303 > t.tab 1.83

we reject H₀; So there is a significant difference in speed between pre and post training stages.

t- test applied because samples are only 10. t calculated value is 3.303, t tabulated value is (0.05 (10-1) degrees of freedom). t tabulated value is 1.83, since t calculated value 3.303 is greater than t tabulated value 1.83 and the conclusion is that there is a significant difference in the speed between pre and post training stages.

Table-2

t- test-Explosive strength (Morning session)

| Pre- training (x) in mtrs. | Post- training (y) in mtrs. | d= (y-x) | d ² |
|----------------------------|-----------------------------|----------|----------------|
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.41 | 2.43 | 0.02 | 0.0004 |
| 2.42 | 2.43 | 0.01 | 0.0001 |
| 2.41 | 2.43 | 0.02 | 0.0004 |
| 2.42 | 2.43 | 0.01 | 0.0001 |
| 2.41 | 2.43 | 0.02 | 0.0004 |
| | | 0.08 | 0.0014 |

$$t = \frac{\bar{d}}{s/\sqrt{n}} \text{ where } \bar{d} = \frac{\sum d_i}{n} = \frac{0.08}{10} = 0.008$$

$$s = \sqrt{\frac{\sum d^2 - n(\bar{d})^2}{n-1}} = \sqrt{\frac{0.0014 - 10(0.008)^2}{10-1}} = 0.009$$

$$t = \frac{0.008}{0.009/\sqrt{10}} = \frac{0.008 \times \sqrt{10}}{0.009} = 2.81$$

t.cal = 2.81
t.tab = t 0.05 (10-1) d. o. f
 $\therefore t.tab = 1.83$
since t cal 2.81 > t.tab 1.83

We reject H₀; Using t-test, it is concluded that there is a significant difference in explosive strength between pre and post training stages.

Table-2(A)
t- test - Explosive strength (afternoon session)

| Pre- training (x) in mtrs. | Post- training (y) in mtrs. | d= (y-x) | d ² |
|-------------------------------|--------------------------------|----------|----------------|
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.43 | 2.43 | 0 | 0 |
| 2.40 | 2.43 | 0.03 | 0.0009 |
| 2.43 | 2.43 | 0 | 0 |
| 2.40 | 2.43 | 0.03 | 0.0009 |
| 2.40 | 2.43 | 0.03 | 0.0009 |
| 2.40 | 2.43 | 0.03 | 0.0009 |
| | | 0.12 | 0.0036 |

$$t = \frac{\bar{d}}{s/\sqrt{n}} \text{ where } \bar{d} = \frac{\sum d_i}{n} = \frac{0.12}{10} = 0.012$$

$$s = \sqrt{\frac{\sum d_i^2 - n(\bar{d})^2}{n-1}} = \sqrt{\frac{0.0036 - 10(0.012)^2}{10-1}} = 0.015$$

$$\therefore t_{cal} = \frac{0.012}{\frac{0.015}{\sqrt{10}}} = \frac{0.012 \times \sqrt{10}}{0.015} = 2.52$$

$$t_{tab} = t_{\alpha, (n-1)} \text{ at } \alpha = 0.05 = 1.83$$

$$\therefore t_{cal} = 2.52 > t_{tab} 1.83$$

We reject H_0 ; Hence it is concluded that there is a significant difference in explosive strength between pre and post training stages.

Discussion: The spike involves a number of steps in order to do the move successfully. In doing this move, a player must first master the approach in which they do a number of steps toward the ball, jump, and finally contact the ball and use a wrist flick in order to hit the ball over the net with the most force.

Ideal form of spiking would include swinging the arms back with the wrists turned back when approaching, swinging the

arms up to use forward momentum to jump, and finally with the wrist back and the arm at a 90 degree angle making full contact with the ball and flicking the wrist to hit the ball over the net with optimum power.

Conclusion

After the analysis of the data it can be concluded that footwork plays a very important part in the approach and arm and leg synchronization towards greater momentum in hitting the ball. It is found that in making the arm thrust in a vertical position on contact, greater force is exerted as well as higher vertical distance. It has been observed that the sequence of steps in spiking shall be accurately otherwise the impact gets diluted. Finally it is found that atmospheric temperature in the afternoon at 2.00 pm at 37°C made an impact on the performance which was not at all good for better performance during summer. So training in speed, explosive strength is very crucial while acquiring the spiking skill.

Recommendations: i. Similar study can be conducted by using players of different sports and games. ii. Players may take fitness training for better performance. iii. Better to play in the morning session especially in summer.

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