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Angular Kinematics and Physical Fitness Analysis of Tall height and Short Height Javelin Throwers- A Case Study of The Islamia University of Bahawalpur, Pakistan

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ABSTRACT

This study was designed to compare the physical fitness and angular position of the university level javelin throwers. Eight tall height and (n = 08) short height javelin throwers were selected for data collection. A handgrip dynamometer, stadiometer, weight balance, 30m dash, flexibility, standing horizontal jump and agility were measured to obtained physical fitness. Two video cameras, a Kinovea software was utilized for video analysis of the Javelin throws. The selected variables were stature, body mass, standing broad jump, maximum bench press handgrip strength, the javelin throw distance. The angle of the knee joint, elbow joints, and stride length were selected while performing the javelin throw. An independent *t*-test was applied to find the mean difference among tall and short height javelin thrower. The result showed the distance of javelin throw, handgrip strength, maximum bench press, vertical jump, and standing broad jump of tall height throwers were significantly higher than the short height javelin throwers. On the other hand, the tall height throwers were also significantly higher in the extension of right elbow, right knee, and stride length than the short height at the time of the javelin release from the hand of the thrower. It was concluded the handgrip strength, maximum bench press and jumps capacity, along with the higher extension of knee and elbow joints are associated with the superior performance of javelin throwers. It is suggested the physical fitness would be included in the selection criterion of javelin thrower and extension and flexion of the knee and elbow may be focused by the trainer and coaches of a javelin thrower.



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1. Introduction

The javelin throw is an extremely technical sport which involves a proper sequential movement of the lower and upper body segments. The release of a javelin is a significantly important part of the throwing techniques (Hussain & Bari, 2012). The angle of release is considered as a vital feature for the covering of maximum distance of the throw, where lower and upper body parts play an important role in the javelin throw (Krzyszowski & Kipp, 2019). The distance of a javelin throw is mainly affected by release angle and body features of throwers (Bakhit & Mohamed, 2010). An accurate throwing performance of javelin depends on the loading force from joints of lower limbs and transfer this momentum of force to the upper limb and finally in to throw (Mohamed et al., 2010). Although, the technique of javelin thrower is an important factor of the throw, along with the physical fitness and height also play an important role in the performance of javelin thrower (Singh & Singh, 2019). The tall and physically fit javelin throwers would perform significantly better at a higher level of competition. There, is a lack of research focus on the performance of javelin thrower in Pakistan. Therefore, this study was aimed to examine the performance of Pakistan javelin thrower.

The purpose of the present study was to examine the kinematic parameters and physical fitness of javelin throwers. It was a hypothesis that there is no significant difference between tall and short height javelin throwers in their physical fitness and kinematics analysis of the javelin throw.

2. Methods and Material

Eight tall height and eight short height javelin throwers were selected for obtaining data. The purposive sampling technique was used for selecting the participants. The age of selected throwers were (tall height = 21.30 ± 2.50 years), and short height = 20.35 ± 2.15 years) stature (tall height = 179.21 ± 6.15 cm), and short height = 161.45 ± 7.23 cm), body mass (tall height = 78.14 ± 5.40 kg), and short height = 70.25 ± 6.21 kg). Data was collected from the male students of the Islamia University of Bahawalpur, Pakistan. The data was obtained inside the department of Physical Education and Sports Sciences, the anthropometric data of height and weight was collected inside the department, physical fitness and javelin throw action and throw distance was captured outdoor playing fields. Data was obtained after taking the formal consent permission from all participants.

3. The Procedure of Data collection

Two video cameras of 30/ frame rate per second were used for recording the actions of javelin throwers. Each thrower performed six throws after getting proper warm up time. A standard Javelin, 2 video cameras with a tripod, calibration frame, Kinovea software, measuring tape, stopwatch, hand strength dynamiter (Camry), a wooden device for flexibility were used for data collection. The Kinovea software used to convert each video into a series of pictures frame by frame. The vertical jump and standing broad jump were also recorded of tall height and short height players. After this conduct a physical fitness test of tall and short javelin throwers was obtained by testing, agility through the zig-zag run, speed with 30m dash, flexibility with sit and reach, stature and body mass with weight balance and stadiometer, strength with right-hand grip strength. A Camry weight machine is used to check the weight of throwers. Flexibility was recorded with a wooden device for set and reach test as described by (Wells & Dillon, 1952). A T-test was used for agility, involving forward, lateral, and backward movements. One maximum bench press of each participant was obtained to test the force of shoulders.

The purposes of giving six trial of each thrower to find an appropriate and best throw of each thrower. The best throw of each thrower was selected for final video analysis by using Kineovea software.

4. Statistical Analysis

Mean and the standard deviation was subscribed for all variables. An independence t-test was applied for comparing the angular position and physical fitness of tall and short height javelin throwers. The significant value was adjusted at P -value < 0.05 for all variables. The numerical data were analyzed by using SPSS software.

5. Result and Discussion

The interpretation of the results in the comparison of physical fitness variables and throwing performance of the javelin throwers of the Islamia University of Bahawalpur, Pakistan.

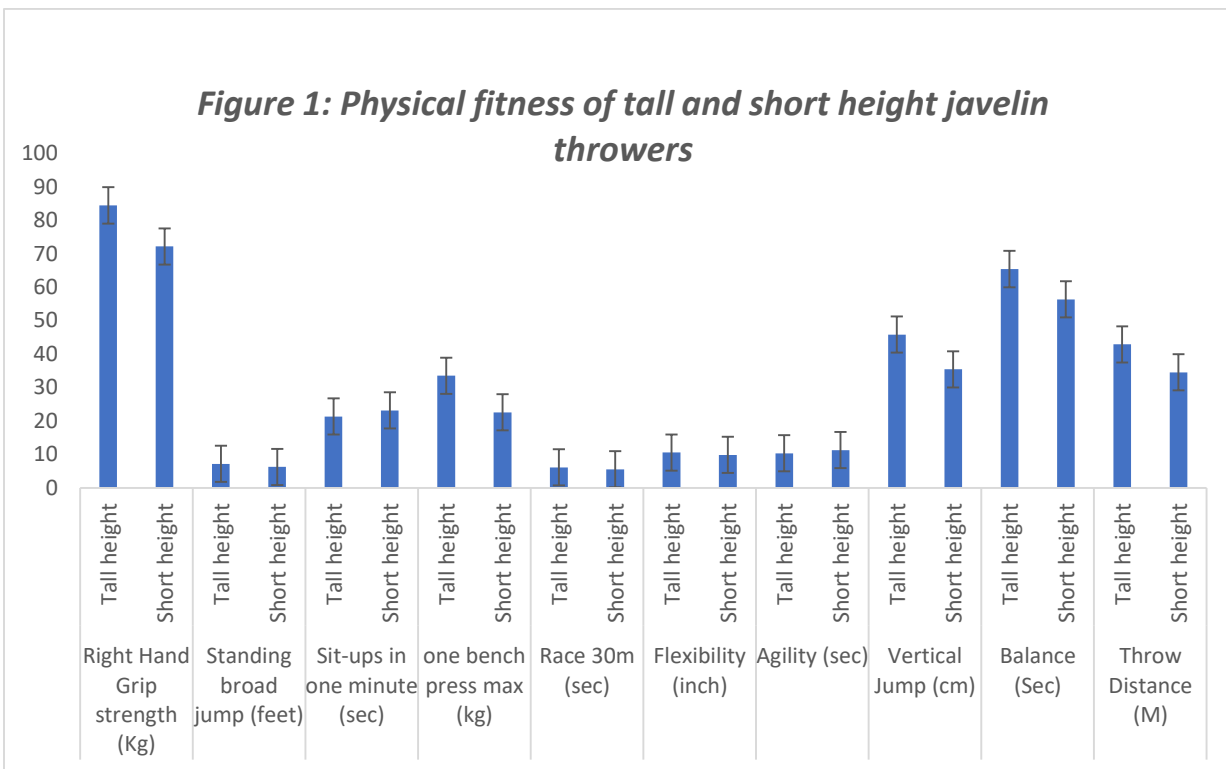


Figure 01 result shows the tall height was significantly higher in right-hand grip strength (<.04), standing broad jump (<.05), bench press (<. 03), vertical jump (<.03), and throwing distance (< .05) of the javelin than the short-height throwers.

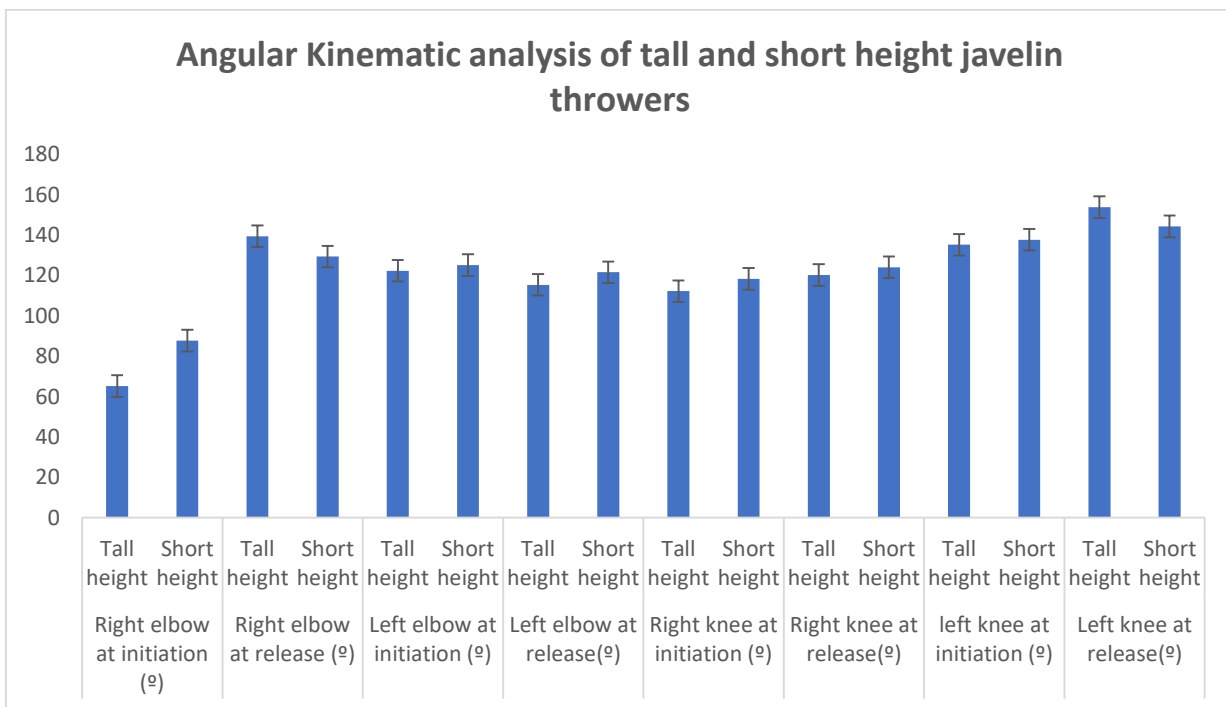


Figure 02 shows that the tall height javelin throwers were significantly higher than the short height javelin throwers in right elbow angle (at initiation <. 05, and at release <.04), left knee angle (at release <.04).



Figure 03 shows that the tall height javelin throwers were significantly higher than short height in stride length (at release $<.05$).

6. Discussion and Conclusion

This study is the comparison of physical fitness and kinematic analysis of the javelin throwers of the Islamia University of Bahawalpur, Pakistan. Murali and Dhinu (2016) have purposed future study to analyze the kinematics factors which involve achieving a longer distance of javelin throw. The result of the study can be used by the coaches for the selection of perfect javelin thrower for a higher level of competitions as like national, and international championship. There was a significant difference in some variables of physical fitness and with the kinematics of javelin throw. Data was collected from ($n = 8$) tall height and ($n = 8$) short height throwers. These participants were selected from the department of physical education and sports science, the Islamia University of Bahawalpur, Pakistan.

The tall height throwers were significantly better than the short-height throwers in the following variables, right handgrip strength, one maximum bench press, vertical jump, standing broad jump, and throwing distance of the javelin throw. This study confirms the findings of Singh and Singh (2019) that physical fitness enhances the throwing capacity of javelin throwers. The present study also confirms that higher fitness level, the proper sequence of the movement of upper and lower extremity joints increases the throwing distance of javelin after release. In the findings of linear and angular kinematics, this study confirms the findings of (Murali & Dhinu, 2016; Jung et al., 2011) that the higher angle of right elbow, knee and trunk are associated the covering maximum distance of the javelin throw. On the other hand, Rani and Singh (2015) have reported a significant relationship among the throwing distance and higher angular position of the elbow and knees at the time of release.

7. Recommendations

The following recommendations are made for coaches and players. The result of the study can be used as an aid in screening and selection of javelin throwers. The similar study may be conducted for selecting of throwers of different age level and competitions. To improve the standard of javelin thrower the talent selection scheme should be launched in both rural and urban areas. The selection of athletes should be based on their anthropometric and physical fitness parameters which help to find the best thrower for international completions.

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