Relationship Between Acceleration And Performance Of The Female Javelin Throwers

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Abstract

Javelin throw gain recognition as an individual sport identity and was counted as a separate event in the Olympic game of 1908 before that it was counted as a part of pentathlon since the first modern Olympic started in the year 1896 at Athens. The present study was conducted 30 (N) female javelin throwers that participated in the national level selected as subjects. The data was collected from the 3rd National Open Javelin Throw Championships 23-24 Octobers, 2021 held at Jawaharlal Nehru Stadium, New Delhi. The researcher utilized free body movement and software tools to capture video footage of athletes throwing javelins. Two cameras were set up at the Sagittal and Frontal planes, respectively, at 2.60m & 3.10m, to capture the athletes' 2D-videography. The mean values is 5.49 meter for the acceleration path and the mean and standard deviation values of 38.59 meter for the performance values of female javelin throwers this states that there is no significant correlation between the performance and the acceleration. However it was positively correlated. The present study is first of its kind and would add literature for further scope of research in the Indian female javelin throwers.

Keywords:- Acceleration, Sagittal Plane, Momentum, Kinematic and Velocity.

Introduction

Javelin throwing was already part of the pentathlon in the first modern Olympic Games in Athens in 1896 and became a

separate event in the Olympic Games in 1908. Unlike other throwing events, not only arm, upper body and core strength are required, but also speed and agility (Kunz & Kaufmann, 1983; Stanković et al., 2010). Indeed, javelin throwing consists of an approach run and the subsequent release of the javelin. The speed of the approach run (a run-up and two or three cross-over steps) appears to be one of the factors determining the success of a javelin throw. It ends in the release phase (one-legged and two-legged support phase) and finally the braking phase (Menzel, 1986).

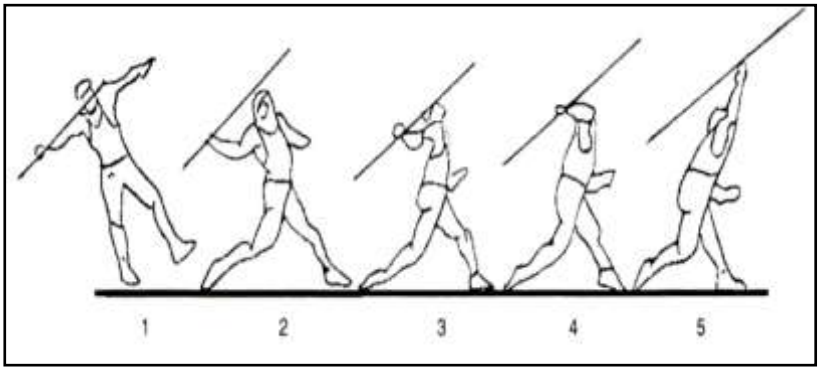
Javelin gain recognition as an individual sport identity and was counted as a separate event in the Olympic game of 1908 before that it was counted as a part of pentathlon since the first modern Olympic started in the year 1896 at Athens. Javelin sport not only required the strength of upper body, extremities and core strength but also agility and speed plays a crucial role in the attaining the performance (Kunz & Kaufmann, 1983; Stanković et al., 2010). The sequencing g oh the javelin throwing has an approach run followed by the javelin release. the acceleration in the three phases of the approach run (approach phase, delivery phase and release phase)

Table 1:- Elements and Phases of Javelin Throw

Throwing Elements	Throwing Phases
Approach Run	i. Acceleration Phase ii. Release-preparatory Phase

The acceleration phase in the Javelin Throw

The final acceleration begins with the active use of the right leg before the left leg is grounded. It ends after the javelin has left



the thrower's hand. This movement phase is presented in Figure 1.

Figure 1:- Beginning and end of the final acceleration phase (OgioitJa, 1993)

The releasing mechanism of the javelin is initiated by the extension of the right leg which is in the collaboration pattern of the javelin throw and acceleration and stability of the thrower's pelvis. For the bracing action the left is extended causing the movement of the hip and left leg halt incontinently particularly, the body's own" proximity" is being utilised. by this bracing action the right side of the body reacts by rotating roughly 90 degrees about the left side, as permitted by the ROM of the alternate" proximity ", which is the gliding contact of the right bottom. (OgioitJa, 1993)

The right side of the body is moved upward and forward leading the javelin to get above the throwing arm. Both the left and the right" extremity" transfer the generated moment of impact (grounding of the left leg) with the upper body, specifically with the throwing arm shoulder. At this point the body becomes like an bow and deltoid muscle generate force of string which can be seen in the 3rd position shown in Figure 1 just before the releasing point of the javelin. (OgioitJa, 1993)

By designedly holding back the throwing arm establishing as crucial position- skill by the stretched muscles of the arm and shoulder (stretch- shortening- cycle)- is achieved. this body position initiates a reaction (reflex) element of the arm and back muscles which make the javelin as an arrow to reach its peak and produces the maximum of momentum and acceleration of the javelin (approx. more than two thirds of the releasing velocity is attained through the throwing arm and further than half of the release velocity is generated in a twentieth of a alternate through the slinging movement of the lower arm). This acceleration is indeed increased by physiological, biochemical and neuromuscular influences (OgioitJa, 1993).

Methodology

In this study, all the participants were considered to be female Javelin Throwers who were participating in the National Level Championship. All the participants were randomly selected based on simple random technique. The subjects who were

coming for National Level Championship were selected from various regions like Rajasthan, Uttar Pradesh, Delhi, Bihar, Gujarat, Haryana, Odisha, Telangana, Maharashtra, Tamil Nadu & Punjab from the age group of 16 - 22 years. Video Analysis Software was used for kinematic analysis of throwing technique of Javelin.

Selection of Tools, Equipment and Instrumentation (arrangement of instrument) with their procedure

a) Video Camera: the camera was setup on the tripod

b) Computer Devices: - the HP laptop of quad core processor in which the software was downloaded

c) Software used for the Analysis:-Kinovea motion capture and analysis software

d) Scale used for the Analysis: - linear and angular Kinematic was uses for analysis

In this research, the researcher utilized free body movement and software tools to capture video footage of athletes throwing javelins. Two cameras were set up at the Sagittal and Frontal planes, respectively, at 2.60m & 3.10m, to capture the athletes' 2D-videography. Additionally, one camera was kept for capturing the preparatory and follow through motion. The data was gathered from the National Championship held at the outdoor Javelin Stadium in New Delhi on 23-24 October 2021. All participants who had submitted their entries for the National Championship or Tournament were screened by the Athletics Federation of India and selected as participants for the study. The two cameras, Sagittal plane & Frontal, were used to record data, and a combination of GoProHero7 Sports &Action Cameras and Digital SLR Cameras D5300 was used for the videography.of the athlete while performing the throw which was further is uploaded with the software used for analyzing data (KINOVEA0.9.5) 25 frame with the wireless frequency band between 5GHz and 2.4GHz of GoPro Hero 7 Sports and Action camera and another camera Nikon Digital SLR Camera D5300 with the operating frequency of 2412 to 2462 MHz

Statistical analysis and results

Table 02: - The acceleration with the performance of the female javelin throw event in 3rd National Open Javelin Throw Championships (n=30)

Statistical Technique/ Variables	Acceleration →	Performance
N ↓	30	30
Mean Value	5.49	38.59
r		0.312

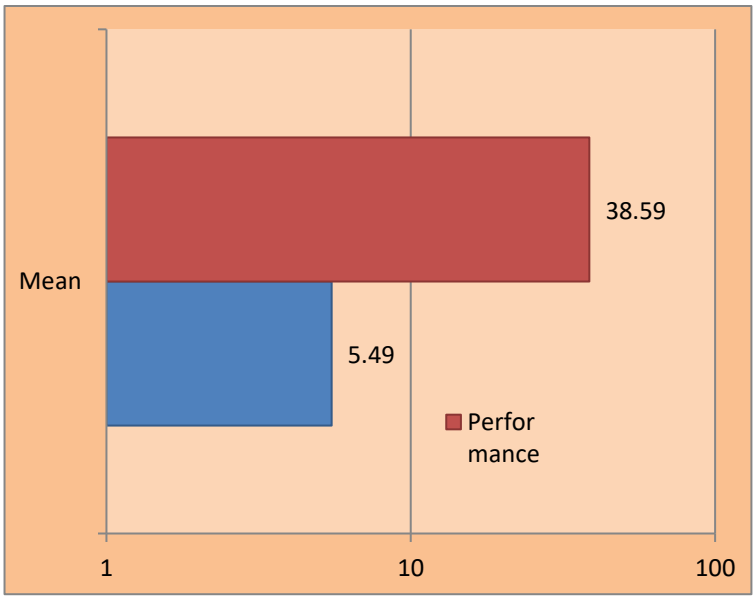


Figure 2: Graphical representation of Mean between Acceleration Path and Performance of Female Javelin Throwers

The mean and standard deviation values of 5.49 and ±0.92 respectively for the acceleration path and the mean and standard deviation values of 38.59 and ±4.76 respectively for the performance values of female javelin throwers, since the calculated value of r (= 0.312) is lesser than the tabulated value of r (=0.361), there is no significant correlation between the performance and the acceleration path in female javelin throwers.

Discussion

Acceleration is the change in the velocity of the person with respect to time. There is not term as absolute motion, as in the approach run phase of the javelin throw there are two phase

primary is the acceleration phase and the secondary is the release-preparatory phase, as stated in the previous studies the acceleration can be maintained for a specific interval of time which is helpful in the conversion of momentum. As per the newton's second law of motion i.e. law of acceleration, force is directly to the acceleration there the more muscle force the more will be the acceleration and vice-versa. In the study of the subjects have the possibilities to increase their length of their acceleration path or can conserve the momentum by doing the following variations:-

a. Early distorting the throwing motion of arm
b. Planting the dominant feet before the non-dominant feet
c. Stretching exercise should be continued during the trial of throw

Conclusions:

The kinematical factors that influence are firstly at the end of the releasing phase the velocity of the CG of the player which transfers the momentum from the athlete to the javelin secondly, the equilibrium of the body segments at the time of release. These two factors were found low in the current study subjects as there were not able to reduce the remaining horizontal velocity by single braking stride. As the throwers reduce their approach velocity during their braking period to a higher extend lead to reduce their CG velocities at the time of release. This could be the reason for that fact the performance was not sustain due to lack of equilibrium in the body segments at the time of release.

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Ethical Statement

The manuscript Relationship between Acceleration and Performance of the Female Javelin Throwers involves female participated in the 3rdNational Open Javelin Throw Championships the consent was taken from the participants as well as the Athletic Federation of India on the permission letter provided by the TMIMT College of Physical Education, Theerthankar Mahaveer University, with reference no. TMU/RO/2021-22/058 before including the videography was

to be done. We author and co-author share, hereby declare the following points:-

1) This material is the authors' own original work, which has not been previously published elsewhere.
2) The paper is not currently being considered for publication elsewhere.
3) The paper reflects the authors' own research and analysis in a truthful and complete manner.
4) The paper properly credits the meaningful contributions of the co-author.
5) The results are appropriately placed in the context of prior and existing research

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