



Impact of releasing height on performance of female javelin throwers

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ABSTRACT

Origins of javelin in the contemporary age may be found in the second half of the 19th century. The researchers' focus in this study is on finding ways to improve javelin throwers' performance along with the impact of releasing height with the female javelin throwers' performance skill. The present study 30 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 mean value (M) and standard deviation (SD) of 2.37 and ± 0.54 respectively for the actual releasing height and the mean score (M) and standard deviation (SD) of 38.59 and ± 4.76 respectively for the performance values of female javelin throwers this states that there is no significant correlation between the performance and the releasing height. The analysis displays that the average baseline displacement for javelin was 36.92 cm and the average height release 2.32 meter; however, 63% of the female javelin throwers did not achieve the optimal height release. The national players achieved a height release of 105.55% above the ideal height. This will assist the throwers with expanding the level delivery to the throw by 1.40 cm. As there is no such specific study focused yet on Indian female javelin thrower. The present study is first of its kind and would add literature for further scope of research in the Indian female javelin throwers.

Keyword:- Releasing Height, Aerodynamic Effects, Approach Run, Velocity and Angle of Release

Received 27.12.2023

Revised 19.01.2024

Accepted 17.02. 2024

INTRODUCTION

Javelin throw is an extremely challenging and technical event in athletics. Origins of javelin in the contemporary age may be found in the second half of the 19th century [1]. At first, there were just a few events in athletics, and it was only for males. In the years that followed, a number of additional competitions were added, and female athletes were permitted to compete.

The men's and women's javelin throw were added to the Olympic programme in London in 1908. The women's throw made its Olympic debut in Los Angeles, in 1932[2-3]. Jan Zelezny holds the men's record at 98.48 meters (since 2017) and Barbora Potáková the women's at 72.28 meters (since 2008). To date, German women have won the most medals, with a total of 5 gold medals and 18 general medals. According to research, as shown in the previous study, a good throw is determined by the height of the throw, the angle of the throw, and the velocity of the release [1].

Javelin throws and Indian women, we discovered Elizabeth Davenport, an Indian javelin thrower, after researching about the historical aspect of the Indian female javelin thrower. She competed in the Asian Games in Tokyo in 1958, winning the silver medal, and the Asian Games in Jakarta in 1962, winning the bronze medal. Gurmeet Kaur Rai, an Indian javelin thrower who competed after the Davenport era and retired after setting her best throw record of 58.64 metres at the Bangalore meet in the year 2000, held the national record until Annu Rani broke it in 2014. Annu Rani made history by glorifying India in the Commonwealth by winning the event [2-3].

A javelin's release qualities must be ideal for both positive aerodynamic effects and the highest theoretical vacuum projectile velocity in order to attain the maximum official distance [5]. The official distance for throwing a javelin was determined by meet officials, which was the distance from the point where the ball landed to the inside of a painted foul line that was parallel to the point where it landed and the radius of the foul line's arc[1].

This distance is determined by the athlete's approach run, release phase, and final phase, as well as the javelin flight [5]. A highly technical training, javelin throwing requires flawless joint synchronisation across numerous planes of motion [8]. The distance a javelin is thrown depends on the wind's strength and direction, as well as the javelin's aerodynamics. However, the two most crucial and controllable characteristics are the javelin release speed and angle [4].

Throwing the javelin under ideal release circumstances is one of the prerequisites for improving performance [20]. Therefore, the problem this study tries to solve is identifying the most optimal height release parameter. In essence, the construction of the javelin and the circumstances surrounding its release play a part in determining the throw's distance [1]. The researchers' focus in this study is on finding ways to improve javelin throwers' performance as well as to ascertain the impact of releasing height with the performance of female javelin throwers.

MATERIAL AND METHODS

For current study 30 female javelin throwers who participated in the national level selected as subjects. The data was collected from the 3rd National Open Javelin Throw Championships 23-24 October, 2021 held at JawaharLal Nehru Stadium, New Delhi. The subjects' age ranged between 16-25 years. The kinematical characteristics based on segmental analysis done on the Kinovea software [10-12]. The height of release was taken and the body height was filed by the subject during the data collected by the researcher during the competition.

All the selected subjects were asked to give their response on personal form and video recording done during the competition condition and convenience of the subjects. After competition, data was calibrated on the software and segmental method was applied on the releasing frame of the video of the respective individuals. Mean and Standard deviation was used to find out the results[10-12].

Two cameras, Sagittal plane and frontal were being placed to record data. Subtle camera GoProHero 7 Sports & Action Camera and Nikon Digital SLR Camera D5300 together was be used to do the videography of the athlete while performing the throw which was further is uploaded with the software used for analyzing data (KINOVEA0.9.5) [10-12], 25 frames 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

RESULTS AND DISCUSSION

The analysis shown in the table below shows the average horizontal displacement for the Javelin at 36.92 cm with an average height release of 2.32 meters. However, 63% of the Javelin Throwers did not achieve optimal height release. According to Bottchner& Kuhl (1998), the optimal height of the release is 105% above the thrower's body height. They have the throwers lose between.05- 9.55cm from the height release [13-14]. This has an effect on the horizontal displacement for the javelin because when the projection height allows for longer flight time, it increases the horizontal displacement of the javelin. The mean value (M) and standard deviation (SD) of 2.37 and ± 0.54 respectively for the actual releasing height and the mean score (M) and standard deviation (SD) of 38.59 and ± 4.76 respectively for the performance values of female javelin throwers this states that there is no significant correlation between the performance and the releasing height in Indian female javelin throwers because the calculated value of correlation score ($r = -0.055$) is lesser than the table log value of correlation score ($r=0.361$)

Previous studies show that raising the height at the same speed and angle increases the gap between the release and the landing, which increases the flight time of the throw and the chance of the throw moving horizontally; hence, the impact that expands the even dislodge for the throw [15-17]. So, even if they throw the same speed and the same angle, taller throwers will throw farther than a shorter thrower. However, in this competition the national player had a height release that was 105.55 % above the ideal. This will help the throwers by extending the level delivery into the throw by about 1.40 CM. Therefore, this means coaches will need to re-evaluate deciding the arrival level of the throw with achieving the ideal velocity and release.

CONCLUSIONS

The ideal height release for a javelin throw has a positive effect on the horizontal displacement of the throw while maintaining the same speed and angle of release.

The ideal height release for the javelin throw is 105.55%, which is the same as the length of the Javelin Throw at the 3rd National Open Javelin Throw Championships

ACKNOWLEDGMENTS

The authors thank all subjects for their voluntary participation in this study. The authors wish to express their sincere gratitude to all the participants for their cooperation

Table 01:-Describe the study sample

Field Event	No. of Subjects	Gender	Average Length	Average Performance
Javelin Throw	30	Female	1.98m	36.92 m

Table 02: - The height of release of the female javelin throw event in 3rd National Open Javelin Throw Championships (n=30) [1]

Subject	Height of COG of Player in meters	Body Height (55.44% of COG of player) Corskey Formula	105% RH - BH	Actual Releasing %	Ideal releasing height (105% of BH)	Performance in meter
Subject 1	1.88	2.92	0.14	117.47	3.07	37.05
Subject 2	1.37	2.13	0.11	146.48	2.24	36.79
Subject 3	1.11	1.73	0.08	118.5	1.81	34.12
Subject 4	1.18	1.833	0.097	109.11	1.93	33.36
Subject 5	1.02	1.59	0.07	121.38	1.66	34.98
Subject 6	1.1	1.71	0.09	102.92	1.8	38.13
Subject 7	1.11	1.73	0.08	68.79	1.81	49.31
Subject 8	1.66	2.58	0.13	134.88	2.71	41.09
Subject 9	1.65	2.56	0.13	100.78	2.69	43.61
Subject 10	1.16	1.8	0.09	123.33	1.89	42.26
Subject 11	1.88	2.92	0.15	117.47	3.07	35.37
Subject 12	1.07	1.66	0.09	127.11	1.75	31.37
Subject 13	1.19	1.85	0.09	110.81	1.94	41.29
Subject 14	1.26	1.96	0.11	129.08	2.07	44.3
Subject 15	1.26	1.96	0.11	105.61	2.07	33.06
Subject 16	1.36	2.11	0.11	100	2.22	27.3
Subject 17	1.16	1.8	0.09	123.33	1.89	34.71
Subject 18	1.2	1.87	0.09	120.86	1.96	27.51
Subject 19	1.06	1.65	0.08	121.21	1.73	34.56
Subject 20	1.09	1.69	0.09	130.18	1.78	46.4
Subject 21	1.12	1.74	0.09	121.26	1.83	31.75
Subject 22	1.19	1.85	0.09	127.57	1.94	28.46
Subject 23	1.87	2.91	0.14	117.53	3.05	28.67
Subject 24	1.16	1.8	0.09	118.89	1.89	44.7
Subject 25	1.37	2.13	0.11	109.39	2.24	39.09
Subject 26	1.14	1.77	0.09	124.29	1.86	26.4
Subject 27	0.97	1.51	0.07	128.48	1.58	36.38
Subject 28	1.32	2.05	0.1	125.37	2.15	44.55
Subject 29	1.2	1.87	0.09	124.06	1.96	46.29
Subject 30	1.05	1.63	0.08	125.77	1.71	34.7
Average	---	1.977	---	---	---	36.92

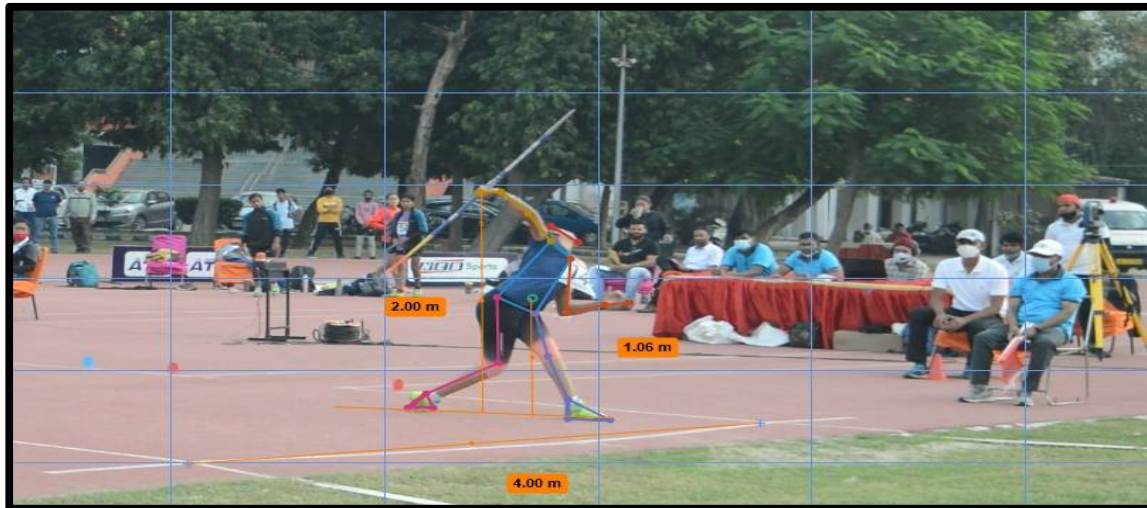


Fig. 01: Software's Segmentation and biomechanical analysis of Female Javelin Thrower

ETHICAL STATEMENT

The manuscript **Impact of Releasing Height on Performance of Female Javelin Throwers** involves female participants in the 3rd National 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 video-graphy 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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CITATION OF THIS ARTICLE

Amandeep K, Yogendra S. Impact of releasing height on performance of female javelin throwers. *Bull. Env. Pharmacol. Life Sci.*, Spl Issue [1]: 2024: 62-66.