

The Optimum Release Height for Javelin Throwers in Proportion to Their Lengths

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This study aimed at identifying the optimum height release for javelin throw proportion to the length of the world champions in the javelin throw event. To achieve this, the researchers used the descriptive correlative approach on a sample of international champions in this event (n=33). Data were collected through some of the previous studies. The study results showed the optimum height release of a javelin throw constitutes a 105.75% proportion to the length of the world champions in this event. The researchers recommend coaches to reconsider determining the height release of the javelin with achieving the optimum velocity and angle release should also be provided. Abbreviations should not be used in the abstract.

Key words: *release height, javelin throw, world champions.*

Introduction

The javelin throw is one of the four track and field athletics throwing events. To achieve maximum official distance, a javelin at release must have the optimal release characteristics for maximum theoretical vacuum projectile motion, as well as for beneficial aerodynamic effects (Vitasalo, et al., 2007). The performance measure of javelin throwing was official distance, which was the distance measured by meet officials from the point of landing to the inside of the painted foul line co-linear with the point of landing and the radius of arc of the foul line. (IAAF, 2009).

The combination of basic physics and human ability is vital in the completion of the optimal javelin throw. And also, there are a number of factors that need to be assessed when performing a successful javelin throw with the four most crucial including: release height, speed, release angle and attack angle. The release height influences the distance greatly with the higher the release the better. This can be contributed to the analogy of throwing a javelin and then

repeating this action off the top of a 30 story building. The javelin thrown from the higher height is going to cover more distance, while this difference is not great as in competition it show cases the importance of height releases.(Clark,2014)

The javelin throw is to subject projectile motion physics. A throw's distance is determined by the release speed, angle, and height of the javelin along with air resistance and drag. While release angle and height play important roles in the range of the javelin, release speed is the most crucial factor in javelin throwing distance (Liu et. al, 2010). Hay (1985) suggested that the release height is an important determinant of the distance thrown. According to (Bottchner & Kuhl, 1998) the release height parameter is mostly determined by the height of the athlete. And also, the optimum height of the release should be 105% higher than the thrower's body height.

In this study the concern of the researchers is how to help javelin throwers achieve better performance. To attain better performance, one of the requirements is to throw the javelin under optimal release conditions. Therefore, finding the optimal height release parameter is the issue this study attempts to deal with. Basically, two factors are involved in determining the range of the javelin throw, one of which is the javelin's structure and the other is the release conditions.

Material & methods

This study was descriptive in nature. The data for this study were collected only from (n=33) International Champions of the javelin throw event, who participated in the World Championships and the Olympic Games in the period between 1992 and 2014, who achieved a horizontal displacement more than 81 m.

Table 1. Describe the study sample

Throw event	Number thrower	Average length/M	Average mass/KG	horizontal displacement/M
javelin throw	33	1.91	94.88	81.44-98.38

The data for this study were collected from some of the studies (Bartonietz, et al, 1996 ; Campos, et al, 2004; Murakami, et al,2006; Lehmann, F,2009; Chiu, C,2009; Yoon, et al,2011; Chae, et al,2011; Saratlija, et al, 2013)

Statistical analysis was completed with using averages and percentages.

Results

As shown in Table 2, the Body height (BH), Release height (RH), Throw horizontal Displacement (HD), 105% of body height, 105% Of (BH) - (RH)/cm and the percentage of release high%.

Table 2. Describe the release height International Champions of the javelin throw event(n=33)

Body height(BH)(cm)	Release height(RH) (cm)	Throw horizontal Displacement(HD) (m)	105% Of body height (m)	%105 Of (BH) - (RH)/cm	The percentage of release high%
186	189	98.38	195.3	6.3-	101.61
187	200	93.14	196.35	3.65	106.95
181	190	90.33	190.05	0.05-	104.97
200	214	89.59	210	4	107
188	195	89.58	197.4	2.4-	103.72
190	214	89.52	199.5	14.5	112.63
188	190	89.41	197.4	7.4-	101.06
190	193	89.18	199.5	6.5-	101.57
180	203	88.95	189	14	112.77
188	188	88.61	197.4	9.4-	100
190	195	87.6	199.5	4.5-	102.63
187	189	87.42	196.35	7.35-	101.06
183	184	86.6	192.15	8.15-	100.54
185	200	86.41	194.25	5.75	108.10
186	199	86.3	195.3	3.7	106.98
190	201	86.27	199.5	1.5	105.78
186	196	86.03	195.3	0.7	105.37
191	199	85.43	200.55	1.55-	104.18
186	209	85.24	195.3	13.7	112.36
188	189	85.18	197.4	8.4-	100.53
172	202	85	180.6	21.4	117.44
188	193	84.78	197.4	4.4-	102.65
196	206	84.6	205.8	0.2	105.10
191	191	84.52	200.55	9.55-	100
185	207	84.3	194.25	12.75	111.89
188	192	84.11	197.4	5.4-	102.12
184	208	83.84	193.2	14.8	113.04
188	190	83.54	197.4	7.4-	101.06
190	197	83.34	199.5	2.5-	103.68
185	191	82.42	194.25	3.25-	103.24
188	203	82.03	197.4	5.6	107.97

191	208	81.81	200.55	7.45	108.90
193	218	81.44	202.65	15.35	112.95
Average The percentage of release high%					105.75

Discussion

According to the data of the International Champions of the javelin throw event, the results obtained in table 2 show that the average height release (198)cm, as well as the average of horizontal displacement for javelin was 86.51cm, however 51.5% of the javelin throwers did not achieve the optimal height release, According to Bottchner & Kuhl (1998) the optimum height of the release should be 105% higher than the thrower's body height, and 48.5% of the javelin throwers. They have achieved greater results from 105% higher than the thrower's body height. And the throwers lost between .05-9.55cm from height release, This effects horizontal displacement for the javelin because when projection height provides longer flight time, this increases horizontal displacement for the javelin. According to the laws of projectiles

$$a.t^2 \frac{1}{2} D = v_i +$$

D: distance, v_i : initial velocity (m.s⁻¹), a: acceleration (m.s⁻²), t = time (s).

increase the height release with same velocity and angle release, it will increase the difference between the level of the release and landing, and thus increase the flight time of the javelin and the opportunity to the javelin movement under the horizontal vector; this is the effect thereby increasing the horizontal displacement for the javelin. and therefore taller javelin throwers can throw farther than shorter ones even if they throw with same velocity and angle release.

Based on the previous presentation the researcher tries to identify the optimum height to release for javelin proportion to the length of the world champions in the javelin event, and achieves 105% of the length of the throwers. However, the optimum height release for javelin reached 105.75% proportion to the length of the world champions in this event. And this will help the thrower to increase the height release to the javelin by 1.40 cm. Therefore, this requires coaches to reconsider determining the height of the release of the javelin with achieving the optimum velocity and angle release.

Conclusions

- 1- the optimum height release for javelin throw reached is 105.75% proportion to the length of the world champions in this event.
- 2- using of the optimum height release for the javelin throw has a positive effect on the horizontal displacement with the same velocity and angle release.



Acknowledgement

A special thanks to Palestine Technical University-Khadoorie for their assistance in realizing this study.

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