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Analysis of vertical movement in parry O' Brien technique of shot put

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Abstract
The purpose of the present study was to analyze vertical motion of Parry O' Brien technique of shot put in light of laws and principles mechanics. Five West Bengal state level women shot putter were selected as subject for present study. Among selected kinematic parameters the displacement, time and velocity of the path of shot were considered. The execution of movement was recorded using video camera Sony, Japan with 25 frames per second. Appropriate software was used to draw the kingram and the data of mechanical parameters were collected using scientific procedure. Mean and standard deviation were computed. Results indicated that during execution of Parry O' Brien technique vertical velocity of the shot was low in glide phase and very fast in release phase.

Keywords: Mechanical parameters, video graphic technique, Kinogram, vertical velocity

Introduction
In track and field athletics there are four types of throwing events such as discuss throw, javelin throw, hammer throw and shot put. In which the metal shot of 7.026 kg for men and 4.025kg for women is put from a circle to specified area by push action to achieve horizontal distance. And for that athlete need more strength as well as specific technique to accomplish the strength to push the shot as far as possible. In Olympic Games and World athletics championship shot put competition elite athletes uses two types of technique such as Spin technique and Parry O' Brien technique. In Parry O' Brien technique there are six different phases such as initial stance, dip, glide, release stance, action of release and follow through phases. All the phases are correlated and have unique contribution to apply the force towards shot to achieve performance. In initial position during start of Parry O' Brien technique shot putter stand erect facing just opposite direction of throw, after that putter leans forward with slight flexion of hip in dip position, execute glide to moves across the circle as well as give the shot fast and vigorous impulse in the direction of path. After execution of glide putter assume release stance in which the body weight is well over the flexed right leg in the centre of the circle, the left foot touch the inner edge of the circle. There after putting action begins with first straitening of the front leg, rotating the trunk to bring the face in the direction of path and accomplish the put. In these consequences the development of force begins with the use of big muscles of straitening leg, the greatest velocity of release of shot is thereby increase and after release stepping outside the circle is prevented by recovery action. Lanka [1] found One example of ballistic movements in sport is the shot put, which is a complex movement that involves segments' translational and rotational motions. Milan Coh, Stanko Stuhec [2], concluded with a scientific phenomenon that Release velocity is generated by all preceding phases, of which the second double support phase contributes the most. The main purpose of the present study was to analyze the vertical movement of Parry O' Brien technique in respect of some selected mechanical parameters in light of laws and principles of mechanics.

Methodology
Five west Bengal state level women shot putters were selected as subjects for the present study. The selected mechanical parameters were the displacement, time and velocity of the path of shot in vertical motion. At first the movement of the execution of technique was recorded scientifically by a video camera Sony, Japan with 25 frames per sec.

The lateral distance was 10 meter and the height of the camera lens was 12 meter with perpendicular direction of the movement. In the second phase kinegram of each execution was developed by drawing stick figures of successive frames from beginning to end of the execution on a transparent graph paper. From this kinegram the data of mechanical parameters were collected using scientific procedure.

Result and Discussion

Table 1: Vertical displacement of the shot from initial stance to release

Subject	Vertical Displacement (m) during Execution of Technique		
	Dip	Glide	Release
1	0.90	0.52	0.62
2	0.28	0.18	0.38
3	0.78	0.12	0.9
4	0.48	-0.02	0.52
5	0.62	0.26	0.38
Mean	0.61	0.11	0.56

It is seen from the table that the vertical displacement was in downward direction in the first phase of dip. In the second phase of glide the vertical displacement was very small. But in the third phase of release the vertical displacement was fairly high.

The mean value during dip was 0.61 m this decreased to 0.11m in glide and 0.56 m in release. The values have been shown in Fig. 1

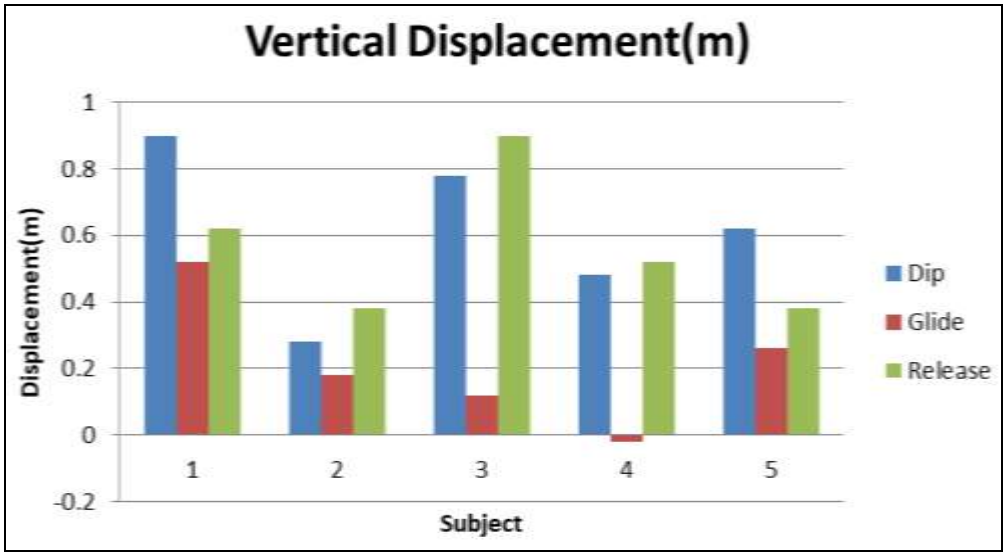

Fig 1: Vertical displacement

In both for dip and glide phase vertical displacements were low. Vertical displacement in release phase was considerably high. Figure indicates that during dip the shot moved upward, during glide its vertical position remains almost same and in release phase the shot moved upward.

Table 2: Duration of different phases of execution of Parry O'Brien technique

Subject	Time(s) for		
	Dip	**Glide**	**Release**
1	5.16	0.6	0.16
2	2.76	0.76	0.12
3	2.44	0.68	0.24
4	2.08	0.6	0.2
5	1.44	0.52	0.16
Mean	2.78	0.63	0.18

It is seen from the table values that the time taken from initial stance to dip was very high with the mean value of 2.78 s. Second phase of glide was faster with the mean time of 0.63 s and the third phase of execution was the fastest with the mean time of 0.18s.

The values have been shown in Fig.2

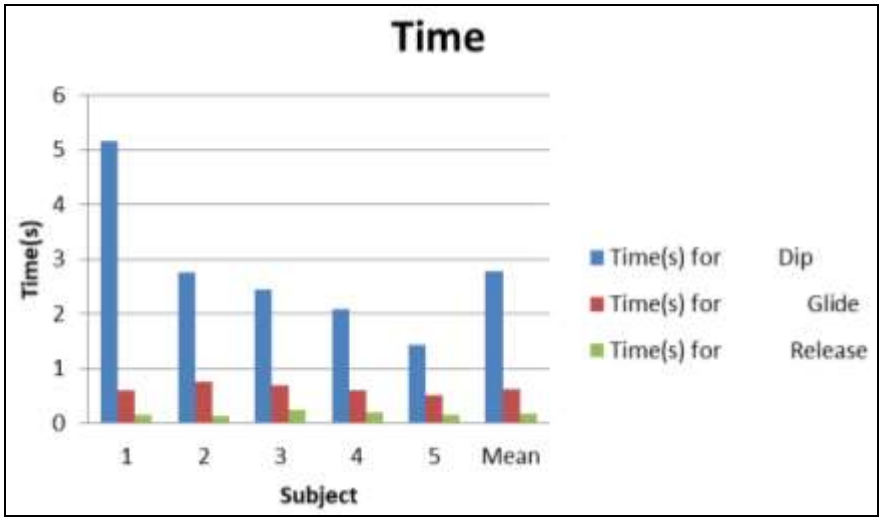

Fig 2: Time for different phases of execution

The time taken for dip was more for all the subjects, the duration of glide appeared to be slightly more than that of release.

Table 3: Vertical velocity of the shot at different phases of execution

Subject	Vertical Velocity(ms-1)during		
	Dip	Glide	Release
1	0.17	0.86	3.87
2	0.10	0.23	3.16
3	0.31	0.17	3.75
4	0.23	-0.03	2.6
5	0.43	0.5	2.37
Mean	0.25	0.35	3.15

It is seen from the table that vertical velocity during dip was low. During glide also the vertical velocity was low. It increases in the third phase with the mean value of 3.15 m/s. The values have been shown in Fig. 3

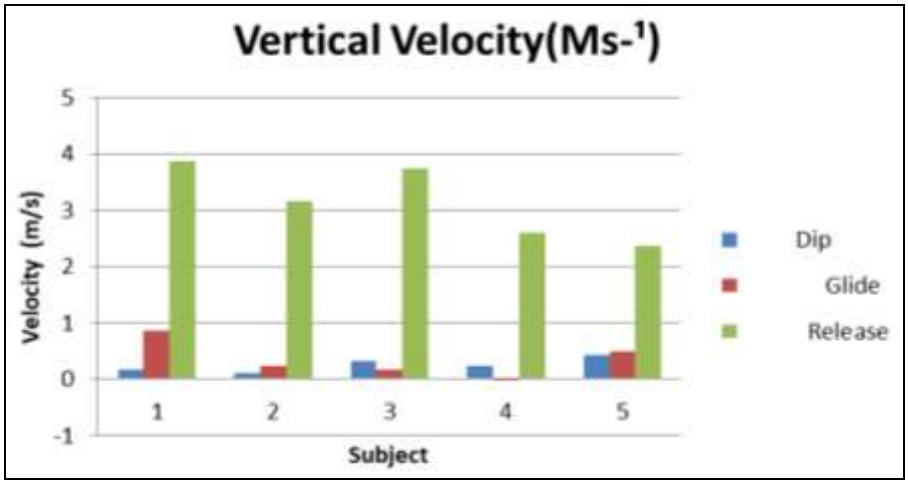

Fig 3: Vertical velocity during execution

The vertical velocity graphs show that vertical velocity in both dip and glide phases was low but the vertical velocity during release was considerably high. The vertical velocity for subject no. 1 and 3 was higher than that of subject no. 2, 4 and 5.

Table 4: Kinematic parameters during release

Subject	Vertical velocity at release(ms-1)	Projection velocity of Release (ms-1)
1	3.87	7.78
2	3.16	5.91
3	3.75	7.07
4	2.60	5.72
5	2.37	4.44
Mean	3.15	6.18

It is seen from the table values that the vertical velocity at release and projection velocity of release was different from different subjects. The velocity of projection was highest for subject no 1 with the value of 7.78 (ms^{-1}) and subject no. 3 was the second in this respect with the value of 7.07 (ms^{-1}).The values have been shown in Fig.4 – 5.

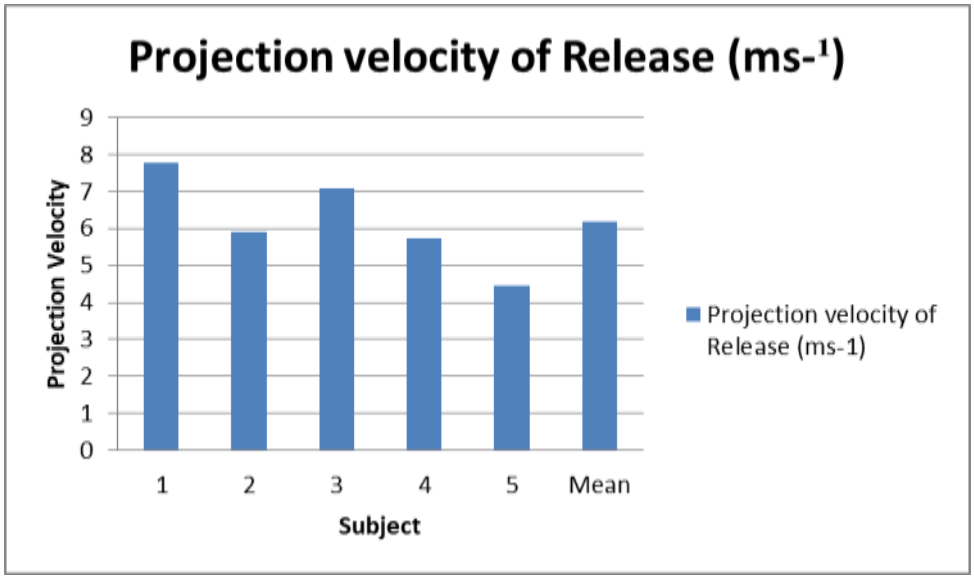

Fig 5: Projection Velocity.

Conclusion

The vertical displacement was low in initial phase and dip phase during the start of execution of Parry O' Brien technique.

The vertical velocity was also low in glide phase during progression of technique.

The vertical velocity increases only after glide phase and reaches its maximum at release phase.

The vertical velocity during release is an important factor because this provides the time of flight for the, motion of the shot during its airborne phase.

There were individual variations in kinematic parameters of executed movement. This variation might be due to quality of technique execution

References

1. Lanka J, Zatsiorsky VM. Shot putting. Oxford: Blackwell Science. Biomechanics in Sport, Performance Enhancement and Injury Prevention 2000, 435-457p. [Google Scholar]
2. Milan Coh, Stanko Stuhec, "3-D kinematic analysis of the rotational shot put technique, IAAF 1981;20(3):353-89. http://centrostudilombardia.com/wp-content/uploads/IAAF-Lanci-Peso/2005-3-D-kinematic-analysis-of-the-rotational-shot-put-technique.pdf
3. Linthorne N. Optimum release angle in the shot put. Journal of Sports Sciences 2001;19:359-72. [PubMed] [Google Scholar]
4. Michael Young, Li Li. "Determination of critical parameters among elite female shot putters," Journal of Sports Biomechanics 2005;4(2):131-48. Doi: 10.1080/14763140508522859
5. Michalina Błażkiewicz, Barbara Łysoń, Adam Chmielewski, Andrzej Wit. Transfer of mechanical energy during the shot put. Journal of Human Kinetics 2016;52(1). DOI: https://doi.org/10.1515/hukin-2016-0001 Published online: 10 Sep 2016
6. Ariel GB. Computerized biomechanical analysis of the world's best shot-putters. Track and Field Quarterly Review 1973;73:199-206. Google Scholar
7. McCoy R *et al*. Kinematic analysis of elite shot putters, Track Technique 1984;90:2868-2871.
8. Ariel GB. Biomechanical analysis of the shot putting, Track and Field Quarterly Review 1980;79:27-37.
9. Ariel GB. Biomechanical analysis of the shot-put utilizing the center of gravity displacement, Track and Field Quarterly Review 1973;73:207-210.
10. Hall Susan. J Basic Biomechanics (3rd edition), WCB/McGraw-Hill book co – Singapore 1:2-3.
11. Hubbard M. Dependence of release variables in the shot put Journal of Biomechanics 2001;34(4):449-456. Russian journal of biomechanics 2003, 4. ISSN 1812-5123.