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A Study on the Applications of Open Source Software for Temporal Analysis of Rotational Technique of Shotput

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Abstract
A study on the applications of open source software for temporal analysis of rotational technique of shotput. For the study, ten national level (male/female) shotputters were randomly selected as subject for the purpose of present study. Each shotputters have three trails, and was been recorded with a video camera using 2d methods. Casio Exilim Ex F1H a standard camera which frequency was 300 frame/second and which was placed at 4.50 meter distance perpendicular to the subject in horizontal plane at height of 1.50 meter. Each trail of each subject was analysed thrice independently using open source software, adopting 2d analysis. The variables were selected were total time taken in rotational technique of shotput, total time taken in preparatory phase of technique, total time taken in execution phase of technique (First turn), total time taken in execution phase of technique (Second Turn), total time taken in final phase (Follow Through). The result presented in table indicate that the calculated mean of total time taken in rotational technique of shotput ranged from 3.52 to 3.89, total time taken in preparatory phase of technique ranged from 1.53 to 1.77, total time taken in execution phase of technique (First turn) ranged from 0.69 to 0.79, total time taken in execution phase of technique (Second Turn) ranged from 0.41 to 0.54, total time taken in final phase (Follow Through) ranged from 0.62 to 1.24 and the coefficient of varicance among the trail of an individual confirmed the movement elasticity that is consistency (validity) among the trail of an individual performance. The findings reflect that all the athlete selected for the study having consistency. The overall coefficient of varriance among selected athletes was 1%, 8%, 1%, 67% respectively. Mean, S.D, coefficient of variance have been calculated to determine the repeatability of individual video analysis i.e. reliability of adopted software. Further the mean, S.D and coefficient of variance of the trails determined the consistency (validity) among the trial i.e. movement elasticity (validity) of each selected samples. Finally the mean, S.D and coefficient of variance determined of differences (validity) among the athletes in regard to selected temporal variable of rotational technique of the shot.

Keywords: Throwing angle, kinematic

1. Introduction
Shotput is the throwing event of athletics. In this sports, players have to throw a spherical iron ball weight of 7.26±0.005 kg. The player who achieve the highest distance declared as a winner. Shot putters have a choice between two techniques, the glide and the rotational (or spin) style. Young competitors, other than beginning shot putters, will naturally gravitate to the more direct glide technique. Most world class male throwers, including 2009 World champion Christian Cantwell, employ the rotational shot put technique. But other competitors, including 2008 Olympic champs Tomasz Majewski and Valerie Vili, do quite well with the glide. The spin technique is similar in principle to the basic discus throwing technique, but there are key differences. For example, the shot put throwing circle is smaller, requiring a tighter turn. But the major difference involves the implement itself. While the discus is held at the end of an extended throwing arm, the shot remains close to the thrower's neck – near the center of the rotation – making balance more difficult. While the rotational style may be tougher to master, quality shot putters should at least learn the technique to discover whether the acceleration generated by the spin leads to greater throwing distances. The speed of the turn to put the shot is directly related to the distance of the shot.

Open-source software (OSS) is computer software with its source code made available and licensed with an open-source license in which the copyright holder provides the rights to study change and distribute the software for free to anyone and for any purpose.

Open-source software is very often developed in a public, collaborative manner. Open-source software is the most prominent example of open-source development and often compared to (technically defined) user-generated content or (legally defined) open-content movements.

1.1 Objectives of the Study

The objectives of the study summarize what is to be achieved by the study. These objectives should be closely related to the research problem. The following were the proposed objectives of the study:-

- To study about the temporal analysis of rotational technique of shotput.
- To measure the total time taken in rotational technique of shotput.
- To measure the total time taken in preparatory phase of technique.
- To measure the total time taken in execution phase of technique (First turn).
- To measure the total time taken in execution phase of technique (Second Turn).
- To measure the total time taken in final phase (Follow Through).
- To study about the relationship between all phases of rotational technique of shotput.

2. Methodology

2.1 Selection of the Subjects

Ten (10) national level (male/female) shot putters were randomly selected as subjects for the purpose of the present study. Most of them were regular participants and medal winners in National level Athletics Tournaments. Each shot putter have three trials, and was been recorded with a video camera using two dimensional methods. Each trail of each subject was analyzed thrice independently using open source software, adopting 2D analysis.

2.2 Selection of the Variables

Literature pertaining to the sport/events of Shot put and keeping the feasibility criteria in mind, especially, the availability of equipment etc. Keeping in view the objectives of study the following biomechanical variable were chosen for the present investigation:-

Table 1: Abbreviations of Selected Variables

S.No	Abbreviation	Variables
1	TTRTS	Total Time taken in the Rotational Technique in the Shot put
2	TTPPT	Total Time taken in the Preparatory Phase of Technique
3	TTEP1	Total Time taken in the Execution Phase(First Turn)
4	TTEP2	Total time taken in the Execution Phase(Second Turn)
5	TTFP	Total time taken in the Final Phase(Follow Through)

2.3 Analysis and Collection of the Data

Using a digital video recording system, video data will be collected and thereafter the video data will be analyzed as per the delimitations of the study for selected variables using open source software for 2D analysis.

Fig 1: Rotational Technique of the Shotput

2.4 Statistical Analysis

- Keeping in view the objectives of the study, feasibility drawn hypothesis, nature of the selected variables following statistical analysis will be computed:
  - Mean
  - Standard Deviation
  - Range
  - Coefficient of Variance

3. Results of the Study

Tabe 2:

S.No	Variables	Mean	Standard Deviation	Coefficient of Variance
1	Total Time taken in the Rotational Technique in the Shot put	3.3	0.03	0.01
2	Total Time taken in the Preparatory Phase of Technique	1.63	0.00	0.08
3	Total Time taken in the Execution Phase(First Turn)	0.74	0.00	0.1
4	Total time taken in the Execution Phase(Second Turn)	0.48	0.00	0.93
5	Total time taken in the Final Phase(Follow Through)	0.85	0.00	0.67

Table no. 2 depicting that the mean of athletes in Total Time taken in the Rotational Technique in the Shot put, Total Time taken in the Preparatory Phase of Technique, Total Time taken in the Execution Phase(First Turn), Total time taken in the Final Phase(Follow Through) are 3.3, 1.63, 0.74, 0.48 and 0.85 respectively. The Standard Deviation of athletes in Total Time taken in the Rotational Technique in the Shot put, Total Time taken in the Preparatory Phase of Technique, Total Time taken in the Execution Phase(First Turn), Total time taken in the Final Phase(Follow Through) are 0.03, 0.00, 0.00, 0.00 and 0.00 respectively. The Coefficient of Variance of athletes in Total Time taken in the Rotational Technique in the Shot put, Total Time taken in the Preparatory Phase of Technique, Total Time taken in the Execution Phase(First Turn), Total time taken in the Final Phase(Follow Through) are 0.01, 0.08, 0.1, 0.93 and 0.67 respectively.

4. Discussion on Findings

The present study was undertaken to study the temporal variables of rotational technique of shotput. The study was conducted on 30 subjects. The data was analyzed by using 2d analysis through kinovea video analysis software. On the basis of findings following conclusion were drawn:

The result revealed the time taken in rotational technique of shotput and time by part as preparatory phase, execution phase (part-1), execution phase (part-2) and follow through. The result shows that the longest time consumes by preparatory phase, follow through, execution phase-1 and execution phase (part-2) respectively.

5. Conclusions

In the light of the findings, it was concluded that the execution phase (part-2) is the least time consuming after that execution phase-1, follow through and preparatory phase respectively. Due to the more speed of athlete in execution phase (part-2) the athlete get the better momentum which results in the more distance achieve by the athlete.

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