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A study on the applications of open source software for two dimensional video analysis of throwing angle of the shot in shotput

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Abstract
A study on the applications of open source software for two dimensional video analysis of throwing angle of the shot in 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 result presented in table indicate that the calculated mean ranged from 38.66 to 43.55 and the coefficient of variance 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 variance among selected athletes was 32%. In the above table 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 variable throwing angle of the shot. The analysis of throwing angle of the shot have complied the objectives i.e. reliability, movement elasticity, validity and feasibility hence, accepted the drawn hypothesis (The analysis using open source software for 2d analysis of throwing angle of the shot is reliable, the analysis using open source software for 2d analysis of throwing angle of the shot will be high movement elasticity, the analysis using open source software for 2d analysis of throwing angle of the shot will have high validity, the analysis using open source software for 2d analysis of throwing angle of the shot put will have feasibility in regard to selected kinematic variable throwing angle of the shot in regard to the same.

Keywords: Throwing angle, kinematic

1. Introduction
The shot put is a track and field event involving "throwing"/"putting" (throwing in a pushing motion) a heavy spherical object the shot as far as possible. The shot put competition for men has been a part of the modern Olympics since their revival in 1896; women's competition began in 1948. Video Motion Analysis is the technique used to get information about moving objects from video. Video motion analysis involves filming an athlete; this footage can then be used to identify issues relating to technique or injuries and improve performance. There are various software for 3d and 2d video analysis. 2d video analysis having wide practice. So, there are certain limitations superiorly whereas 3d analysis is comprehensive, authentic but demand lot of expertise. 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.

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2. Objectives of the study
2.1 The following are the proposed objectives of the study
➢ Exploring the feasibility of the open source software for two dimensional video analysis of Shot put.
➢ Proposing some model of analysis of adopting open source software for two dimensional video analysis of Shot put.
➢ Identifying the delimitations/limitations of open source software for two dimensional video analysis of Shot put".
➢ Analyzing the technique of Shot put.

3. Materials and methods
3.1 Selection of the Subjects
Ten (10) national level (male/female) shotputters 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 shotputter have three trials, and was been recorded with a video camera using two dimensional methods. Each trail of each subject was analysed thrice independently using open source software, adopting 2D analysis.

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

3.3 Introducing to Kinovea Software for Video Analysis
Kinovea is video analysis software dedicated to sports. It targets primarily the coaches, athletes and medical professionals. It can also be useful in ergonomics and animation study. The kinovea software was used and it can install on a computer running one of the following Microsoft Windows operating systems: Vista®, XP, and Windows 7(On 64 bits computer software's). We have to check that our computer complies with the minimum requirements. Install the .NET framework if necessary. An installer is available for download on the website.

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
➢ Coefficient of Variance

5. Findings of the Study
The findings have been documented in the table below

Subject	Name	∑ Mean	∑ S.D.	∑ C.V.
1	Ashwani Solanki	43.11	0.39	0.89
2	Asgar	42.33	0.00	0.00
3	Navjeet Kaur	39.67	0.00	0.00
4	Sanjeev	40.22	0.19	0.50
5	Harmeet Kaur	42.33	0.39	0.91
6	Pradeep	38.66	0.00	0.00
7	Narendra	40.44	0.19	0.48
8	Vijay	40.33	0.00	0.00
9	Kuldeep	43.55	0.19	0.44
10	Ranjith Vargeese	38.66	0.00	0.00
	∑∑	40.93	0.13	0.32

N = 10 (Mean, S.D, Coefficient of Variance), All measurements in degree. S.D. = Standard Deviation, C.V. = Coefficient of Variance, ∑∑ = Grand Mean, Standard Deviation and Coefficient of Variance.

The Mean and Standard Deviation (M ± S.D) of the Throwing Angle of the Shot for Ashwani Solanki was 43.11±0.39, for Asgar was 42.33 ± 0.00, for Navjeet Kaur was 39.67 ± 0.00, for Sanjeev was 40.22 ± 0.19, for Harmeet Kaur was 42.33 ± 0.39, for Pradeep was 38.66 ± 0.00, for Narendra was 40.44 ± 0.19, for Vijay was 40.33 ± 0.00, for Kuldeep was 43.55 ± 0.19, for Ranjith Vargeese was 38.66 ± 0.00. The mean ranged from 38.66 to 43.55 and the coefficient of variance among these video analysis of each trail was 0.32 and the coefficient of variance 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 C.V. among selected athletes was 32%.

6. Results and Discussions
In the above table 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 variable throwing angle of the shot.
The analysis of throwing angle of the shot have complied the objectives i.e. reliability, movement elasticity, validity and feasibility hence, accepted the drawn hypothesis (The analysis using open source software for 2d analysis of throwing angle of the shot is reliable, the analysis using open source software for 2d analysis of throwing angle of the shot will be high movement elasticity, the analysis using open source software for 2d analysis of throwing angle of the shot will have high validity, the analysis using open source software for 2d analysis of throwing angle of the shot put will have feasibility in regard to selected kinematic variable throwing angle of the shot in regard to the same.

7. Conclusions
Within the limitations of the present study, the following have been concluded:-
➢ Analyzing by using variable highly reliable in regard to selected kinematic variable such as namely throwing angle of the shot.
➢ Analyzing using open source software for two dimensional video analysis of sports technique (rotational technique) of shot put have high movement elasticity /consistency (validity) in regard to selected kinematic variable throwing angle of the shot.
➢ Analyzing using open source software for two dimensional video analysis of rotational technique of shot put have high validity.
➢ Analyzing using open source software for two dimensional video analysis of shot put (rotational technique) have feasibility in regard to selected kinematic variable throwing angle of the shot.
➢ The selected variables namely throwing angle of the shot have been used to analyzed the shot putting(rotational technique) and which gives the enough description of the rotational technique useful for pedagogic purposes.

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