

KINEMATIC ANALYSIS OF THE SNATCH TECHNIQUE OF COLOMBIAN 62 KG DIVISION WEIGHTLIFTERS PARTICIPATING IN THE 52nd NATIONAL CHAMPIONSHIP, "CARTAGENA 2014".

Restrepo M. Alfredo¹⁻², Gutiérrez Ricardo¹, Chica Catalina¹, Celis Ricardo³.

Sports Science Center - Coldeportes. Bogotá, Colombia¹.

Manuela Beltrán University. Bogotá, Colombia².

Risaralda's weightlifting's League. Pereira, Risaralda, Colombia³.

The purpose of this study was to identify the behaviour of some kinematic lineal variables during the execution of the snatch of the Colombian 62 kg division weightlifters participating in the 52nd National Championship in Cartagena in 2014, to recognize the movement patterns in this population, to identify the principal values of velocity peaks, the percentage of the height reached by the bar at its maximal point in relation to the weightlifter's height, the relationship between the time of execution and the maximal peak of 3D velocity. All of the lifts, 100%, were analyzed of which 56% (n32) were valid.

KEY WORDS: Weightlifting, Barbell Velocity, Snatch.

INTRODUCTION: The Sport Science Center –Coldeportes, is the major site of research for Colombian Olympic Athletes. The purpose of this study was to identify the behaviour of some kinematic lineal variables during the execution of the snatch of the Colombian 62 kg division weightlifters in order to serve as a tool to identity patterns of movement. This weight category has given the country two Olympic silver medals and several world medals, hence, thus far, these achievements have not had the necessary biomechanical support. This investigation quantified the main kinematic variables of the last world cup bronze medalist in this division and 10 more major athletes.

METHODS: Video capture with 2 Fujifilm SL1000 to 120 fps video cameras was done during the 52nd Senior National Weightlifting Championship in Cartagena, Colombia (2 m.a.s.l.). Each camera was located respectively on the right sagittal plane and on the frontal plane at a distance of 12 meters. A tridimensional cube of 8 points was used as reference to calibrate the area of execution. Editing and synchronization of videos was made with virtualdub 1.10.4 software. Digitalization and lineal kinematic analysis was done with the Skillspector v 1.3.2 software. Tracking was made of the central point of the bar from the right hand side of the athlete. Thirty two (32) lifts on 11 athletes participating in the Snatch were filmed and analyzed because athlete F quit the third lift. For the statistical analysis the lifts were divided into four groups as described in table 1. Group A are effective lifts by the three athletes that won medals, group B are effective lifts by athletes that obtained a 4th-11th place, group C are all effective lifts, and group D are all “no lifts”.(table 1).

Table 1
Analysis Groups Division.

	Number of Lifts	
Group A	7	Effective lifts by medal winners
Group B	11	Effective lifts by athletes obtaining 4th to 11th place
Group C	18	All effective lifts
Group D	14	All No Lifts

RESULTS: Of the 32 lifts made by the 11 weightlifters 56.25% were valid effective lifts with barbell weight ranging from 78 Kg to 140 kg. (Figure 1.)

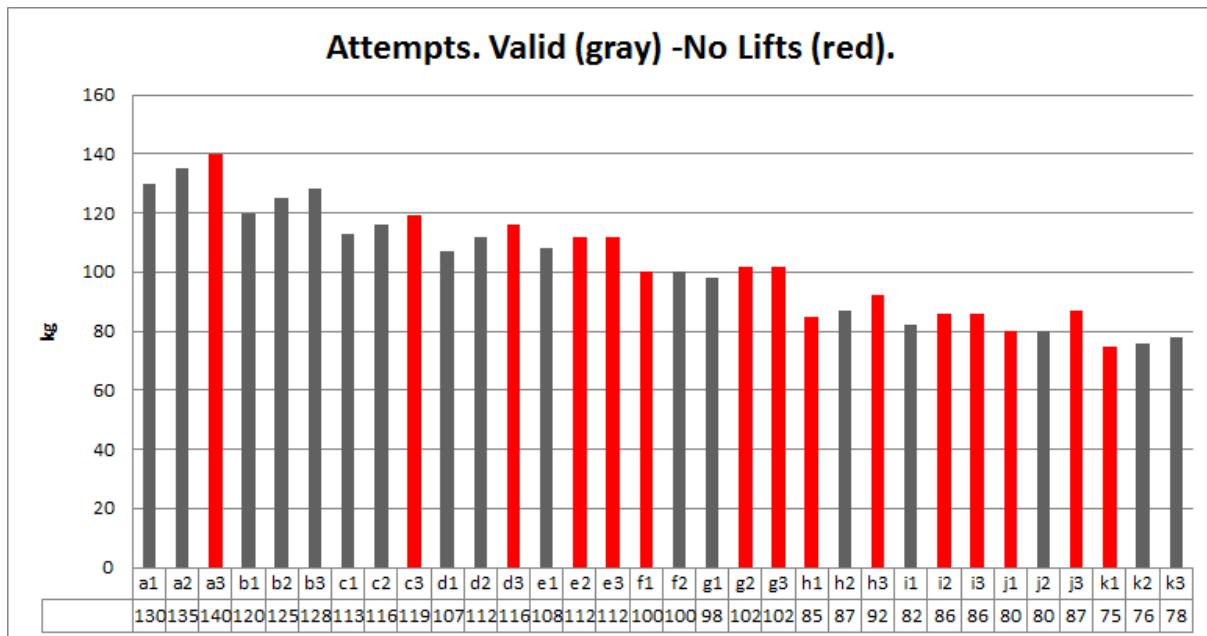


Figure 1: Valid Attempts and No Lifts, to Barbell weight.

As for the time evaluated from the moment the barbell leaves the platform to the moment when it reaches its maximal 3D velocity and vertical velocity, it was found that 71 % of group A lifts reached maximal 3D velocity and vertical velocity at the same time. The other 29% took 0.033 seconds more from the moment maximal 3D velocity was reached to the moment maximal vertical velocity was obtained. For the lifts of group B the 91% coincided at the same instant to reach velocity, in just an attempt the maximal vertical velocity was achieved after as maximal velocity 3D, with the same time the group A, for the group C, the 78% coincided at the same instant to reach velocities. And the group D it sowed an inconsistency of 29%, three of the four analyzed attempts reached maximum vertical velocity with the same difference subsequent of 0.033 seconds and the other attempt with 0.066 seconds after the instant of the maximum 3D velocity.

Table 2. Average of Peak Maximum of vertical Velocity and 3D Velocity.

	Average of Peak Max 3D Velocity (m/s) and max value.			Average of Peak Max vertical Velocity (m/s) and max value		
Group A	1.73	SD 0.1	1.93	1.69	SD 0.1	1.9
Group B	1.75	SD 0.1	1.89	1.71	SD 0.1	1.82
Group C	1.74	SD 0.1	1.93	1.70	SD 0.1	1.9
Group D	1.75	SD 0.1	1.9	1.70	SD 0.1	1.84

There is a high correlation between the time to reach the maximum height of barbell and the time to reach the maximum 3D velocity on all four groups for on the overall analysis of the 32 weightlifting analyzed. (Figure 2).

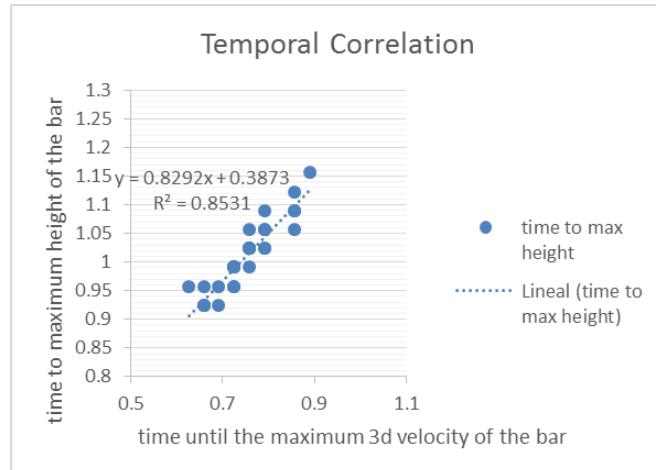


Figure 2: Temporal correlation.

A difference of only 0.3% was identified between the valid lifts and no lifts on the percentage of maximum height reached by the barbell to the athlete's height, but it is important to consider that the drop distance was 3.3 cm longer for the weightlifters located at the 4th to 11th ranking position of competition. (Table 3).

Table 3. Barbell vertical behavior, Percentage relationship.

	Percentage of maximum height reached by barbell to the athlete's height		Drop distance of barbell.	
Group A	71.9 %	SD 1.1	13.1 cm	SD 2.8
Group B	72 %	SD 1.5	16.3	SD 3.6
Group C	72 %	SD 1.4	15.1	DS 13.6
Group D	71.6 %	SD 1.4	N/A*	N/A*

*N/A= only 5 of the 14 No lifts managed a drop distance of the barbell with an average of 14.6 cm (SD 2.9).

DISCUSSION: Similar values on the vertical velocity were reported by Hung-Ta et al. (2010) with a maximum vertical velocity close 1.962 m/s in this research, the winner reached a value of 1.9m/s. As for the drop distance of barbell, only group A is consistent with what was found by Gohan et al (2012), referring values close to 100% of 0.13m. No significant relation was observed between the high level weightlifters and the duration of the phases as reported by Harbili (2012).

CONCLUSION: The weightlifters that obtained medals had the lowest barbell drop distance values; this may be an indicator of mechanical efficiency. The maximum height reached by the barbell is an important factor to quantify. If the percentage of the maximum height reached by the barbell to the athlete's height is less than 71.9%, it will probably lead to being a "no lift". There is a high correlation between the time taken to reach the maximum barbell height and the time to reach the maximum 3D velocity.

REFERENCES:

- Campos J, G., Rabadé, E, J.. (2009). Análisis cinemático de la trayectoria de la barra en la arrancada y su relación con el rendimiento. Apunts Educació física y deportes. 2do trimestre/ 59-65.
- Gohan, H., Hasan, A., Erbil, H. (2012). Three-Dimensional Kinematic Analysis of the Snatch Technique for lifting different barbell weights. *Journal of Strength and Conditioning research*, 26 (6)/1568-1576.

- Gordon, D., Mullane, S, L., Conway, P, P., West, A,A, (2012). Development of a novel system for monitoring strength and conditioning in elite athletes. *9th conferenceof the International Sports Engineering Association (ISEA)* 34/496-501.
- Harbili, E. (2012). A gener-based kinematic and kinetic analysis of the snatch lifts in elite weight-lifters in 69-kg category. *Journal of sport science and medicine*. 11/162-169.
- Hung-Ta, C., Chih-Hung, W., Kuangyou, B, C. (2010). The three-dimensional kinematics of a barbell during the snatch of Taiwanese weightlifters. *Journal of Strength and Conditioning research*. 24 (6)/1520-1526.
- Ulareanu, M, V., Potop, V., Timnea, O, C., Cheran C. (2014). Biomechanical Characteristics of movement phases of clean & jerk style in Weightlifting performance. *Social and Behavioral Sciences* 137/64-69.
- Vassilios, G., Nickos, A.,Panagiotis, A., Christos, C., Giorgos, M., Athanasios, G,. (2002) Comparative 3-Dimensional kinematic analysis of the snatch technique in elite male and female Greek weightlifters. *Journal of Strength and Conditioning research*. 16 (3)/359-366.