

## ENERGY PARAMETER ANALYSIS FOR SNATCH MOVEMENT OF ELITE CHINESE WEIGHT LIFTER

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**INTRODUCTION:** To date, research on weightlifting was mainly using kinematics approach to investigate the techniques used in competitive situation, for example the two-dimensional analysis of the trajectory of the bar and the selected parameters of body movement. To our knowledge, little is known about the energy expenditure during the snatch movement. The purpose of this study was to explore the energy expenditure characteristics in performing of snatch movement.

**METHODS:** All lifts using snatch technique in all men's weight categories of the 8th China Weightlifting Championships were analyzed using video techniques. The present study focused on the snatch technique from the beginning of the movement to the highest point of the barbell. This phase is considered to be the most important and technically most difficult part in the whole performance [1] [2]. The work ratio, average power and equivalent force of different phases were studied. All energy parameters were derived from kinematics parameters of the bar and the lifter according to the principle of conservation of energy [3]. In order to determine the needed kinematics parameters, video analysis was employed. The camera (JVC9800, PAL 50 Hz) was positioned on the side of the platform and set at the filming speed of 50 fps. All data were digitized by Ariel Performance Analysis System (APAS, USA).

**RESULTS:** Table 1 presents the major energy parameters of 24 selected attempts from four weight categories. All parameters (equivalent force, average power and work ratio) are associated with the barbell during the movement. The column 1, 2, 3 and 4 in table 1 corresponds to the knee joint extending, first pull, transition, and second pull phases, respectively.

**Table 1 The energy parameters of different phases.**

Weight category	Parameters	Movement phase			
		1	2	3	4
59 kg n=6	Equivalent force (N)	1643	1443	1340	1845
	Work ratio (%)	23.6	24.9	15.1	36.4
	Average power (W)	795.5	1361.5	1571.8	2650.5
76 kg n=6	Equivalent force (N)	2146	1867	1637	2761
	Work ratio (%)	22.3	24.9	15.6	37.2
	Average power (W)	1075.6	2243.1	2353.4	4502.7
91 kg n=6	Equivalent force (N)	2182	2183	1493	2927
	Work ratio (%)	20.7	29.8	9.7	39.8
	Average power (W)	1215.2	2653.3	2237	4880.7
99 kg n=6	Equivalent force (N)	2291	2234	1411	2924
	Work ratio (%)	20.5	27.9	14.8	36.8
	Average power (W)	1216	2180.4	1917.4	4713.4

**DISCUSSION AND CONCLUSION:** The Work ratio in the first pull and second pull phase is higher than in other phases, as can be seen in Table 1. The results demonstrate the importance of the first pull and second pull to the whole snatch movement. Wolfgang reported a similar pattern of the snatch technique based on the kinematics parameters [4]. The average power is also an important energy parameter in assessing the snatch technique. It may have practical implication in the strength training of the weight lifting. In summary, energy parameters are useful to reflect the essence of the snatch technique and provide a more practical reference for training.

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