

Morphological and dynamical Rates as a function to predict results of snatch lift for women's Olympic weightlifting

Khaled Ebada, Ibrahim Abdel Hady, and Mohammed El-Rouby

Abstract— This study aims to identify the relationship of some morphological and dynamical Rates proportions and their contribution to results for snatch lift women's weightlifting at the 2012 Summer Olympics in London, and predict the results of weightlifting in terms of morphological and dynamical Rates. Applied to the study of a sample of 88 women lifters participate in competitions weightlifting competitions at the 2012 Summer Olympics in London, where the average age 25.61 ± 3.68 years and length 160.18 ± 6.27 cm, weight 67.04 ± 14.33 kg, in different weights categories 48, 53, 58, 63, 69, 75, +75 kg. Were analyzed video film, which was filmed for women lifters knowledge of the International weightlifting Federation of the Technical Committee during the Olympic Games of London 2012. The analysis of the film was shot with a camera with a speed of 25 cadre / s, video to analyze the best attempt to women lifters to determine the performance time phases Snatch using program Maxtraq on line Manual Version 5.5, It was found the Mechanical Work. Results showed that there was a direct correlation between morphological, dynamical Rates and the results of snatch to Women lifters and have been identified as well as the contribution proportions morphological and dynamical Rates of results in snatch. Any that he could predict the results of snatch women lifters both in terms of morphological and dynamic variables using predictive equations. These results must be taken into account by the coaches and Women lifters for use in predicting results of snatch and the planning of training programs for the women's weightlifting.

Keywords— Morphological and Dynamical Rates, Women lifters, Weightlifting, Olympic, Snatch.

I. INTRODUCTION

THAT promote level athletic including, it achieves the best achievements associated with the necessity of having some of the features and characteristics of the physical, fitness, technical skills, which is built on the actual dynamic information, etc. which can be on their way to predict what will arrive it in the future. Studies have indicated that the length and weight of women lifters important elements when developing the training strategy, as well as biomechanics and interested in studying the impact of internal and external forces

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applied to the Human body. In addition, use the correct form of the status of a private body when weightlifting training and given the weakness evaluation process in choosing women lifters and lack of dependence on sound scientific foundations in weightlifting as the personal experience of the coach are determined by the lifters choice [1], [2] [4], [5].

Weightlifting one of sports that received of scientific and technological progress became recording data on morphological rates (age, height, weight), dynamic variables results Women Olympic lifters utilized in planning to develop training programs, as well as to know the extent of progress in recording world records in the world championships and courses Olympic for Women lifters in weightlifting [8].

Women's Olympic weightlifting characterized techniques for the snatch by an increased barbell displacement from platform to an overhead position. Which is referred to as the performance phases as follows for Snatch (Pull Phase I - Pull Phase II - Squat- standing up) [7], [9], [10], [15], [16].

The Morphological rates, dynamical variables and performance time indicators evolution maximal strength and performance for women's weightlifting depend where evaluating the relationship between strength and weightlifters performance skills of different length, body mass and performance time [9], [10], [11], [12].

The researcher noted through its expertise in the field of weightlifting, brief him on studies, scientific research, references specialized weightlifting, within science researcher found that there is a dearth of research studies for determining the Morphological and dynamical Rates as a function to predict results of snatch lift for women's Olympic weightlifting. Prompting researchers need to provide sound scientific methods can be based in the selection women lifters including the development of predictive equations for level of skill of the lifters in terms of morphological rates and dynamic variables that would give clear perception when developing training methodology as has the information and will improve the selection of women lifters [4], [5].

This study aims to identify the relationship of some morphological and dynamical Rates proportions and their contribution to results for snatch lift women's weightlifting at the 2012 Summer Olympics in London (SOL), and predict the results of weightlifting in terms of morphological and dynamical Rates.

II. METHODS

Applied to the study of a sample of 88 Women lifters participate in competitions weightlifting at the 2012 (SOL),

where the average age 25.61 ± 3.68 years and length 160.18 ± 6.27 cm, weight 67.04 ± 14.33 kg, in different weight categories (WC). Were analyzed video film, which was filmed for Women lifters. The analysis of the film was shot with a camera with a speed of 25 cadre / s, video to analyze the best attempt to Women lifters to determine the performance time phases Snatch using program Maxtraq on line Manual Version 5.5, It was found the Mechanical Work to following model Figure 1.

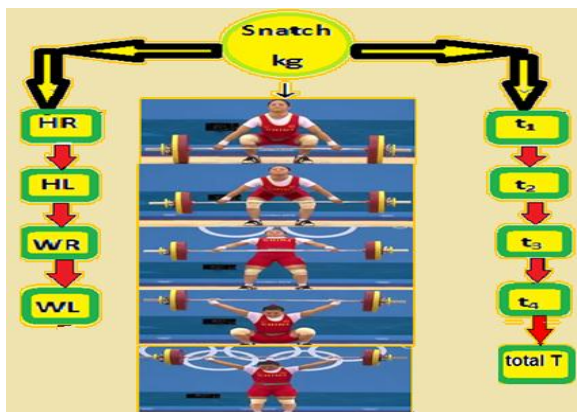


Fig. 1 Theoretical model for the dynamic variables under consideration

Analyzed are four main phases to snatch a performance (Pull Phase I - Pull Phase II - Squat- standing up) [3], [9], [10], [15], [16] [17]. Calculates of Performance time according to following formulas: Calculates of Performance time according to the following formulas have been specified time (t) for each phase of performance from the beginning to the end of the phase to Snatch, Where the Pull phase I (t1), Pull phase II (t2), Squat (t3), Standing up (t4), total T. (t5).

Vertical Height right sides (HR) and left (HL) the mechanical work was calculated for the left (WL) and right (WR) side of the bar

By the following equation: $WR = HR * F$ where (f) = raised weight /2*(9.8)

$WL = HL * F$ where (f) = raised weight /2*(9.8) [6], [13], [14].

III. STATISTICAL ANALYSIS

SPSS statistics 21 was used to apply formulas statistical by calculating: mean, standard deviation, correlation, stepwise regression.

IV. RESULTS

Indicates Table I the existence of a number 88 statistically significant correlation coefficient at statistical significance 0.05 where the value of $P < 0.05$ level 2-tailed in different weight categories for Women lifters between morphological (weight) (Length) and dynamic rates (WR)(WL) and the results of snatch. Number 74 is positive correlation coefficient increased by 84.09%, and number 14 negative correlation coefficients increased by 15.91%. It is clear from results a relationship between morphological rates, dynamic variables and performance of women's Olympic weightlifting.

Shown in Table II that dynamic variables is the first contributor to performance of snatch level ranged between 44.5 - 69.4%, rates of morphological contributor is the second rate ranged between 17.6 - 33%, and time performance phases snatch third by contributor was 10.40 - 22.5% in weight categories of 48, 53 and 69kg. Bringing become a predictive equation to predict the outcome of snatch to women lifters in terms of morphological, dynamic rates and time performance phases are as follows:

Snatch 48 kg = $94.069 + (-.468) \text{ Length} + (-.601) \text{ weight} + (-1.188) t1 + (18.334) t2 + (-5.546) t3 + (.838) t4 + (.357) \text{ WL} + (.839) \text{ WR}$.

Snatch 53 kg = $-799.369 + (-.020) \text{ Length} + (13.324) \text{ weight} + (-18.231) t1 + (76.515) t2 + (-21.315) t3 + (42.085) t4 + (1.744) \text{ WL} + (-.642) \text{ WR}$.

Snatch 69 kg = $120.087 + (-.671) \text{ Length} + (-.158) \text{ weight} + (6.465) t1 + (-8.511) t2 + (.285) t3 + (-.616) t4 + (-.158) \text{ WL} + (1.211) \text{ WR}$.

While he was performance phases time is the first contributor in snatch results ranged between 56-56.3%, and dynamic variables is second contributor ranged between 35.4-42), morphological rates third contributor rate of 5.1 -6.3% in the weight category 58 and 75 kg. Thereby become a predictive equation to predict results of snatch of women lifters in terms of morphological, dynamic rates and time performance phases are as follows:

Snatch 58 kg = $186.207 + (-.423) \text{ Length} + (-3.107) \text{ weight} + (-165.187) t1 + (-74.244) t2 + (12.125) t3 + (74.770) t4 + (.394) \text{ WL} + (.584) \text{ WR}$.

Snatch 75 kg = $-23.855 + (-.231) \text{ Length} + (.529) \text{ weight} + (30.253) t1 + (-4.447) t2 + (-39.661) t3 + (6.429) t4 + (.112) \text{ WL} + (.969) \text{ WR}$.

As she morphological rates is the first contributor in performance of snatch results rate 70.1%, time performance phases is the second rate contributor 23.5%, dynamic variables contributor third rate of 6.4% in weight category 63kg. Thereby become a predictive equation to predict results of snatch of women lifters in terms of morphological, dynamic rates and time performance phases are as follows:

Snatch 63 kg = $-102.648 + (-.081) \text{ Length} + (-.920) \text{ weight} + (103.192) t1 + (181.142) t2 + (1.720) t3 + (.441) t4 + (.494) \text{ WL} + (-102.648) \text{ WR}$.

While she was morphological rates is the first contributor in performance of snatch results rate 60.7%, dynamic variables is the second rate contributor 23.2%, time performance phases contributor third rate of 15.7% in weight category +75kg. Thereby become a predictive equation to predict results of snatch of women lifters in terms of morphological, dynamic rates and time performance phases are as follows:

Snatch +75 kg = $44.319 + (-.137) \text{ Length} + (-.001) \text{ weight} + (-15.832) t1 + (-3.848) t2 + (-22.367) t3 + (1.806) t4 + (2.296) \text{ WL} + (-1.319) \text{ WR}$.

TABLE I
CORRELATION MATRIX BETWEEN OF MORPHOLOGICAL AND DYNAMIC RATES AND THE SNATCH RESULTS FOR WOMEN
LIFTERS IN DIFFERENT WEIGHT CATEGORIES IN OLYMPICS LONDON 2012

WC	Variab	snatch	Leugt	weight	t1	t2	t3	t4	t5	WL	WR
48 kg	Snatch	1.000									
	Length	-.574*	1.000								
	Weight	-.181	.350	1.000							
	t1	.213	-.106	-.320	1.000						
	t2	.107	.021	.057	.158	1.000					
	t3	.398	-.016	.187	-.127	-.171	1.000				
	t4	-.186	.159	-.110	.106	-.121	-.075	1.000			
	t5	.315	-.035	-.204	.837***	.235	.284	.374	1.000		
	WL	.973***	-.386	-.082	.184	.068	.495	-.156	.337	1.000	
	WR	.966***	-.351	-.090	.211	.077	.479	-.168	.350	.998***	1.000
53 kg	Snatch	1.000									
	Length	.007	1.000								
	Weight	.385	-.385	1.000							
	t1	.076	-.185	-.150	1.000						
	t2	-.079	-.252	-.153	-.528*	1.000					
	t3	-.001	-.058	-.114	.752***	-.695***	1.000				
	t4	-.025	-.300	-.227	.933***	-.478*	.819***	1.000			
	t5	.009	-.251	-.209	.958***	-.503*	.862***	.987***	1.000		
	WL	.924***	.303	.184	.067	-.220	.067	-.053	-.004	1.000	
	WR	.898***	.320	.189	.032	-.215	.046	-.078	-.034	.988***	1.000
58 kg	Snatch	1.000									
	Length	-.175	1.000								
	Weight	-.134	.361	1.000							
	t1	-.295	.497*	-.047	1.000						
	t2	-.686***	.343	-.116	.540*	1.000					
	t3	-.012	.173	-.369	.764***	.360	1.000				
	t4	-.393	.429*	.124	.872***	.481*	.484*	1.000			
	t5	-.350	.388	-.172	.950***	.661***	.854***	.825***	1.000		
	WL	.851***	.288	.069	-.090	-.470*	.066	-.267	-.186	1.000	
	WR	.871***	.231	.086	-.095	-.475*	.058	-.259	-.189	.989***	1.000
63 kg	Snatch	1.000									
	Length	.661*	1.000								
	weight	.833***	.731**	1.000							
	t1	-.247	-.242	-.091	1.000						
	t2	-.247	-.242	-.091	1.000	1.000					
	t3	.205	.168	.230	-.721**	-.721**	1.000				
	t4	.882***	.479*	.614*	-.381	-.381	.102	1.000			
	t5	.887***	.478*	.622*	-.348	-.348	.081	.999***	1.000		
	WL	.996***	.712*	.855***	-.259	-.259	.198	.866***	.870***	1.000	
	WR	.994***	.706*	.859***	-.280	-.280	.203	.877***	.880***	.999***	1.000
69kg	Snatch	1.000									
	Length	-.280	1.000								
	weight	.361	-.009	1.000							
	t1	.047	-.357	-.179	1.000						
	t2	-.190	-.338	-.292	.768***	1.000					
	t3	-.378	-.324	-.240	.465	.522*	1.000				
	t4	.213	-.267	.109	.742***	.377	.412	1.000			
	t5	.088	-.330	.006	.821***	.530*	.602*	.970***	1.000		
	WL	.982***	-.104	.404	-.025	-.284	-.455	.187	.040	1.000	
	WR	.983***	-.100	.383	-.023	-.264	-.453	.176	.033	.999***	1.000
75 kg	Snatch	1.000									
	Length	.065	1.000								
	Weight	.105	.005	1.000							
	t1	.289	.077	-.396	1.000						
	t2	-.467	.192	-.264	.364	1.000					
	t3	.067	-.277	-.222	.693**	.498*	1.000				
	t4	-.423	-.471	-.081	-.482	-.088	-.024	1.000			
	t5	-.420	-.498*	-.198	-.233	.092	.236	.959***	1.000		
	WL	.993***	.127	.125	.302	-.435	.089	-.440	-.431	1.000	
	WR	.994***	.134	.100	.301	-.432	.058	-.499*	-.496*	.992***	1.000
+75 kg	Snatch	1.000									
	Length	.756***	1.000								
	Weight	.200	.481	1.000							
	t1	-.140	-.197	-.210	1.000						
	t2	-.273	-.105	-.065	.586*	1.000					
	t3	.035	.182	.199	-.448	-.221	1.000				
	t4	.569*	.225	-.090	-.072	-.608*	.050	1.000			
	t5	.559*	.218	-.105	.035	-.521*	.059	.992***	1.000		
	WL	.992***	.808	.259	-.143	-.240	.071	.548*	.542*	1.000	
	WR	.984***	.820	.283	-.154	-.241	.082	.557*	.551*	.998***	1.000

** . Correlation is significant at the 0.05 level (2-tailed).

TABLE II
 PERCENTAGE OF CONTRIBUTION MORPHOLOGICAL AND DYNAMICS RATES IN THE SNATCH FOR WOMEN LIFTERS IN DIFFERENT
 WEIGHT CATEGORIES IN OLYMPICS LONDON 2012

W.C	Variables	Measure unit	B	Std. Error	T	Sig.	Contribution Percentage%
48 kg.	(Constant)	-----	94.069	47.142	1.995	.184	
	Length	Cm	-.468	.078	-5.991	.027	33%
	weight	kg	-.601	.951	-.631	.592	
	t1	sec	-1.188	3.167	-.375	.744	
	t2	sec	18.334	9.402	1.950	.190	22.5%
	t3	sec	-5.546	6.152	-.901	.463	
	t4	sec	.838	7.210	.116	.918	
	WL	N.m	.357	.864	.413	.720	44.5%
WR	N.m	.839	.806	1.042	.407		
			sum				100%
53 kg.	(Constant)	-----	-799.369	389.537	-2.052	.086	
	Length	Cm	-.020	.374	-.054	.959	17.6%
	weight	kg	13.324	5.529	2.410	.053	
	t1	sec	-18.231	25.260	-.722	.498	
	t2	sec	76.515	49.329	1.551	.172	10.4%
	t3	sec	-21.315	22.873	-.932	.387	
	t4	sec	42.085	30.536	1.378	.217	
	WL	N.m	1.744	.497	3.510	.013	69.4%
WR	N.m	-.642	.454	-1.414	.207		
			sum				
58 kg	(Constant)	-----	186.207	151.786	1.227	.260	
	Length	Cm	-.423	.269	-1.571	.160	3.6%
	weight	kg	-3.107	2.456	-1.265	.246	
	t1	sec	-165.187	218.514	-.756	.474	
	t2	sec	-74.244	55.500	-1.338	.223	56%
	t3	sec	12.125	37.621	.322	.757	
	t4	sec	74.770	64.369	1.162	.283	
	WL	N.m	.394	.869	.453	.664	35.4%
WR	N.m	.584	.787	.741	.483		
			Sum				
63 kg	(Constant)	-----	-102.648	94.922	2.928	.061	
	Length	Cm	-.081	.181	-1.081	.475	70.1%
	weight	Kg	-.920	.815	-.448	.732	
	t1	Sec	103.192	61.561	-1.129	.461	
	t2	Sec	181.142	103.120	1.676	.342	23.5%
	t3	Sec	1.720	1.580	1.757	.329	
	t4	Sec	.441	.782	1.089	.473	
	WL	N.m	.494	.816	.564	.673	6.4%
WR	N.m	-102.648	94.922	.605	.654		
			Sum				100%
69 kg	(Constant)	-----	120.087	28.246	4.252	.013	
	Length	Cm	-.671	.042	-15.944	.000	20.7%
	weight	Kg	-.158	.404	-.391	.715	
	t1	Sec	6.465	6.194	1.044	.355	
	t2	Sec	-8.511	12.563	-.677	.535	27.5%
	t3	Sec	.285	1.795	.159	.881	
	t4	Sec	-.616	.591	-1.042	.356	
	WL	N.m	-.158	.304	-.521	.630	51.8%
WR	N.m	1.211	.292	4.143	.014		
			Sum				100%
75 kg	(Constant)	-----	-23.855	59.338	-.402	.715	
	Length	Cm	-.231	.141	-1.634	.201	1.5%
	weight	Kg	.529	.515	1.027	.380	
	t1	Sec	30.253	16.361	1.849	.162	
	t2	Sec	4.447	32.923	.135	.901	56.3%
	t3	Sec	-39.661	27.544	-1.440	.246	
	t4	Sec	6.429	2.737	2.349	.100	
	WL	N.m	.112	.241	.467	.673	42%
WR	N.m	.969	.240	4.037	.027		
			Sum				
+75 kg	(Constant)	-----	44.319	50.823	.872	.447	
	Length	Cm	-.137	.277	-.493	.656	60.7%
	weight	Kg	-.001	.047	-.032	.977	
	t1	Sec	-15.832	32.539	-.487	.660	
	t2	Sec	-3.848	56.391	-.068	.950	15.7%
	t3	Sec	-22.367	31.283	-.715	.526	
	t4	Sec	1.806	4.212	.429	.697	
	WL	N.m	2.296	.799	2.874	.064	23.2%
WR	N.m	-1.319	.851	-1.549	.219		
			Sum				

V. DISCUSSION

The results indicate the existence of a positive correlation between morphological rates, performance time and mechanical work expended on both sides of the right and left the bar and snatch results for Women lifters. It means that greater the body length more all of its weight and quantity of mechanical work greater the weight of gravity, which flies Women lifters in the snatch [11]. Outcomes resulted the rates of morphological is the first contributor to the results of in snatch weight category 63 - +75 kg contribution rate ranged between 60.7% -70.1%. While mechanical work variables on both sides of the first occupied the bar contributor to weight category 48, 53,75kg contribution rate respectively 44%, 69.4%, 42%. While it was the first contributor to weight category 58, 75kg Performance time to snatch the Women lifters contribution rate 56%, 56.3% respectively. This means that morphological and dynamic rates contribute to the results of snatch for Women lifters Olympic percentages ranged between 44% - 70.1%. In addition, that there other factors that affect the outcome of Women lifters to snatch at the rate of 29.9%, of which the training situation and training programs bringing become prediction equations to predict results of snatch in terms of morphological and dynamic rates in different weight category [8], [10].

Results also showed women lifters 63kg, +75 kg weight categories, the longest women lifters move weight greater distance so they doing more work to reach end of lift [11], where Work done = force x distance. The greater increased length women lifter of height weight center of mass increased from the ground, leading to increased energy the stored in her position. Undoubtedly will contribute to increasing the total energy women lifters where amount of gravitational potential energy an object on ground has depends on its: GPE (J) = mass (kg) x gravitational field strength (or 'g') (N/kg) x height (m) [6], [13], [14].

As showed 58, 75 kg Weight categories increase speed muscle contraction, which contributed to increase the percentage contribution of performance time in these weights. While in 69,53,48kg Weight categories increased contribution of mechanical work exerted ratios due to increased weights filed special these weights rates [8], [11].

A researcher sees that Women lifters and trainers should develop the maximum muscle strength in their training programs [3], and morphological and dynamical Rates proportions and their contribution to results for snatch lift women's weightlifting when evaluate the level of performance and results Women lifters. The use of it when the selection Women lifters national teams to participate championships and Olympic Games [8], [10].

VI. CONCLUSION

There are statistically significant relationship between each of the morphological, dynamic rate, time performance and snatch results of Women lifters. As the dynamic rates contributes to results snatch for Women lifters Olympic contribution rate ranged 6.4-69.4%, and contributes to morphological rates ranged between 1.5-70.1%, contributes time performance by ranged between 10.4-56.3% in different

weights categories . Predictable level of record Women lifters in terms of both morphological, dynamic rates and time performance by equation as follows: Results of snatch for Women lifters Olympians = fixed amount + morphological rates (value) + performance time phases (value) + dynamic rates (value). These results must be taken into account by the coaches and Women lifters for use in predicting results of snatch and the planning of training programs for the women's weightlifting.

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