Relative strength, Body mass and height as Predictors of Olympic Weightlifting Players Performance

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ABSTRACT

The research aims to know the relationship between relative strength, Body mass and height with Olympic weightlifting player's performance and the contribution percentage for the relative strength, Body mass and height in performance for weightlifting players during Olympic Games. Applied this research on weightlifting Olympic players results in Sydney 2000, Athens 2004 and Beijing 2008. The numbers of players (397) Olympic weightlifting players they calculation their results in Olympic Games and they represent (80.52%) from the original community, average age (25.80 ± 4.52) year, average Height (170.76 ± 9.71) cm, and average weight (85.19 ± 25.07) kg. The Results that provided statistical indicative relationship between the relative strength, Body mass and height with Olympic weightlifting players performance. Shifted so that contribution percentage for the relative strength (13.1%), contribution percentage for Body mass (38.6%), and the contribution for the height (43.6%) In Olympic Games weightlifting players performance. It can predict level number for weightlifting players with indication the relative strength, Body mass and height. The interesting for muscle strength development especially the maximum strength for weightlifting players by indicative relative strength indicate to achieve the correlated between it and between the Body mass and height.

Key Words: relative strength, Body mass, height, Olympic weightlifting players, performance, maximum strength.

INTRODUCTION

Through analysis Olympic tournament for weightlifting players, we found many new records in weightlifting player's results. Referring that to many factors including trainings program relative and absolute strength, Body mass and training age. Zatsiorsky (18) muscular strength training for weightlifting players depend on volume and sector muscle reaches to 50% from Body mass for that they can (in heavy weights categories) overcome the relative strength distinguish high intensity during the training comparison with light weights because of presence relation between the strength , body weight and performance. Kauhanen et al. (11) see that we could evaluate performance weightlifting players as indicator Body weight because the presence positive relationship between Body weight and the performance. Stone et al. (13) there is a relationship between maximal strength and performance skills for weightlifting. Depending on the difference of height, the player male and female body mass. Added to those men are stronger than women even in the case of equal height and body mass.

The relative strength for weightlifters light weights bigger than weightlifters heavy weights than among Quad categories heavier in the snatch and clean & jerk lift Kanyevsky (10). It is considered an indicator of the relative strength index and his relationship with gravity of necessary indicators for weightlifting players. While performing snatch and clean & jerk a lift which is needed for maximum muscular strength through gathering of the force of working and partners muscles in performance especially legs and arms muscles to overcome gravity force and bar weight resistances. Because the power has relation with demand speed in making change in weight movement during maximum strength performance. Because the muscle games under the influence demand of the weight which goes with its ability to exert strength during pause point during contraction stage this is known as compensatory acceleration which depends on the resulting muscle strength in performance doesn't depend on weight that we want to overcome only but it depends on movement acceleration. Haleczko (7) the main reason to put weights categories in weightlifting sport is to show the relation between body weight and muscle strength for lifters under pressure of competition. That divided for many different weights for categories push us to necessary off evaluate relative strength to compare their performance with weight and body mass. Thé and Lori (14) said that's we can predict absolute and relative strength for male and female body lifters by age indictors, body mass, gender because both of relative and absolute muscle strength differs by difference of body mass.

Knowing the differences in contribution relative strength, body mass and height in performance weightlifting Olympic players lifting is considered. The scientific indicator while planning training program suit different ages categories in a way that suits developing numeric level for weightlifting players,

aiming to study the relative strength, body mass and height to predict performing level of Olympic weightlifting

MATERIALS AND METHODS

The research purposive sample 493 players have been chosen by purposive method from Olympic weightlifting players partners in Olympic tournaments in Sydney 2000, Athens 2004 and Beijing 2008. (96) Players disregarded from competition ship their result was not considered due to withdraw from competition net applying the trials needed from lifts. The search has been conducted on a sample of 397 Players Olympic weightlifting players their result were calculated they present 80.52% percent from the original society. Their average age 25.80 ± 4.52 year, their average height 170.76 ± 9.71 cm and their average weight 85.19 ± 25.07 kg (16, 17).

Statistical analysis

SPSS was used to apply formulas statistical by calculating: average, standard deviation, correlation, stepwise regression, also calculating relative strength and body mass ratio. The formula as follows: relative strength = maximum strength / body weight, and body mass index.
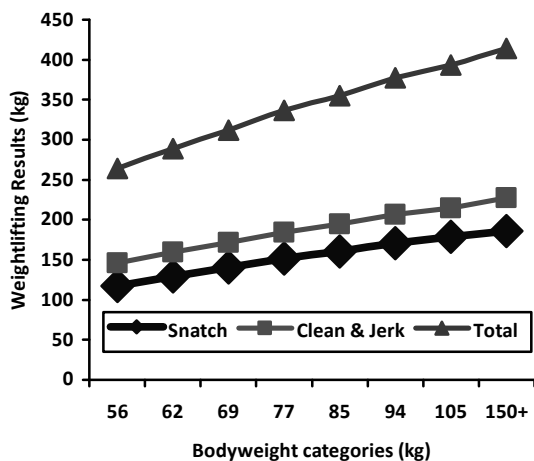
RESULTS

Figure 1. The average for number level in snatch and clean & jerk lifts and the sum for weightlifter players in Olympic tournaments Sydney 2000, Athena, 2004 and Beijing
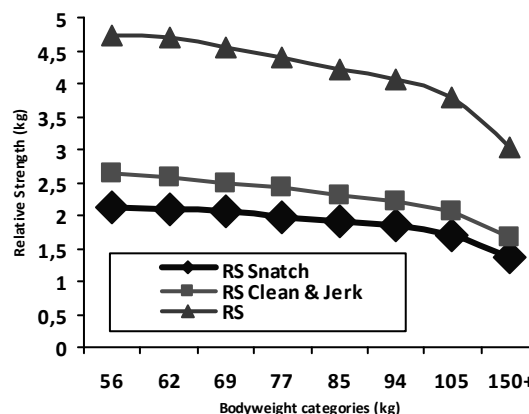

Figure 2. The average for relative strength for working muscles in snatch and clan & jerk lifts for weightlifting players in Olympic tournaments Sydney 2000, Athena 2004 and Beijing
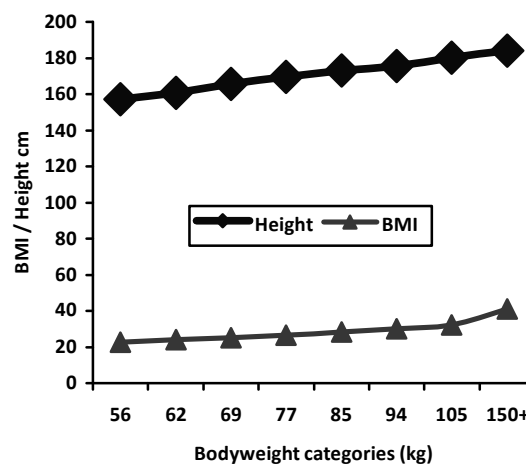

Figure 3. The average the height and body mass for weightlifter players in categories of different weights in Olympic tournament
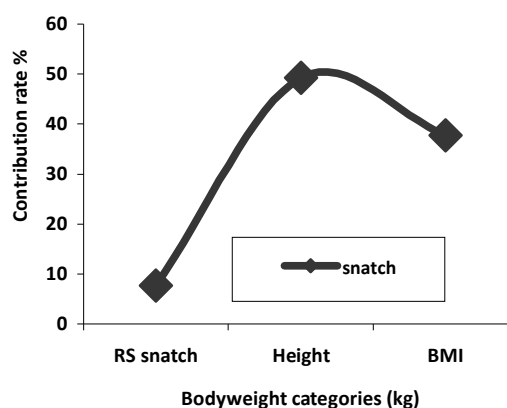

Figure 4. The contribution percentage for the relative strength, body mass and height in snatch performance for weightlifting Olympic players
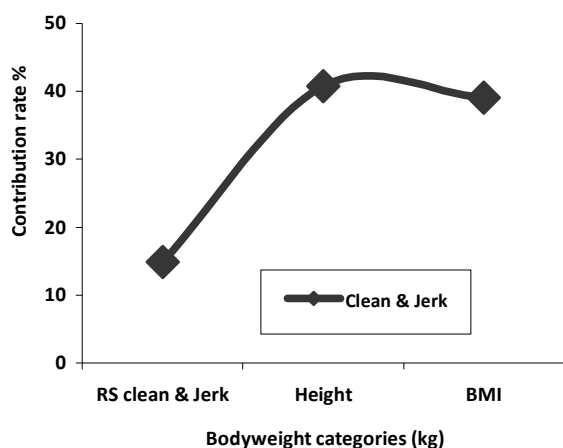
Figure 5. The contribution percentage for the relative strength, body mass and height in Clean & Jerk performance for weightlifting Olympic players

Table (1) shows there is a 28 correlation agent statistical indication on the statistical indicator level of significance 0.01. The value of $P < 0.01$ by reflective both of sides includes 14 correlation positive agent 50% and number 14 negative correlation agent 50%. The results suggest a relationship between relative strength, BMI, height and performance of the Olympic weightlifting players.

Table (2) Shows that the height is the first contribution snatch lift performance with the contribution percentage 49%, the second contribution is the body mass with contribution percentage was 37.8%, while the relative strength for working muscles in snatch lift was the third contributor with contribution percentage 7.7% for that the predictive formula to predict weightlifting performance in snatch lift in Olympic tournaments by indicating relative strength, body mass and height is the performance of snatch lift from weightlifting players= -456.96 + relative strength muscles in snatch lift (81.33) + height (1.98) + body mass (4.17).
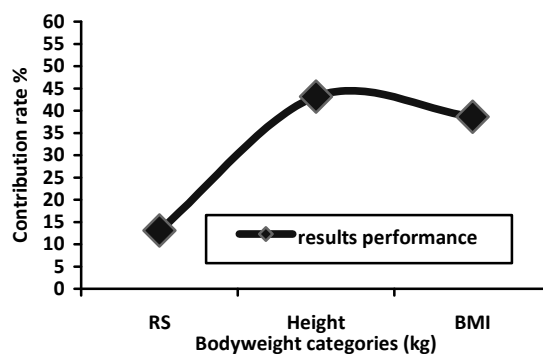

Figure 6. The contribution percentage for the relative strength, body mass and height for the weightlifting Olympic player's performance

Table 1. Correlation between relative strength, BMI, height and number level for the weightlifting players in Olympic tournaments

	Snatch	Clean & Jerk	RS Snatch	RS Clean & Jerk	RS.	Height	BMI	Total	Sig.
Snatch		.970**	-.278**	-.383**	-.340**	.720**	.701**	.991**	0.000
Clean & Jerk	.970**		-.344**	-.386**	-.372**	.732**	.731**	.993**	0.000
RS Snatch	-.278**	-.344**		.961**	.988**	-.629**	-.751**	-.317**	0.000
RS Clean & Jerk	-.383**	-.386**	.961**		.992**	-.675**	-.783**	-.390**	0.000
RS.	-.340**	-.372**	.988**	.992**		-.661**	-.778**	-.362**	0.000
Height	.720**	.732**	-.629**	-.675**	-.661**		.577**	.732**	0.000
BMI	.701**	.731**	-.751**	-.783**	-.778**	.577**		.724**	0.000
Total	.991**	.993**	-.317**	-.390**	-.362**	.732**	.724**		0.000

** Correlation is significant at the 0.01 level (2-tailed).

Table 2. The contribution percentage for relative strength, body mass and height in snatch performance for Olympic weightlifting players

Model		Unstandardized Coefficients		Standardized Coefficients				
		B	Std. Error	Beta	T	Sig.	Contribution Rate %	Sum Contribution Rate %
Snatch	Constant	-456.96	9.06		-50.38	0.000		
	RS Snatch	81.33	1.69	0.901	47.98	0.000	7.7	
	Height	1.98	0.04	0.737	48.61	0.000	49.2	94.7
	BMI	4.17	0.07	0.952	53.25	0.000	37.8	

Table 3. The contribution percentage for relative strength, body mass and height in Clean & jerk performance for Olympic weightlifting players

Model		Unstandardized Coefficients		Standardized Coefficients			Contribution Rate %	Sum Contribution Rate %
		B	Std. Error	Beta	T	Sig.		
Clean & Jerk	Constant	-550.04	11.47		-47.91	0.000		94.8
	RS clean & Jerk	79.26	1.76	.930	45.01	0.000	14.9	
	Height	2.39	0.04	.777	49.39	0.000	40.8	
	BMI	5.10	0.09	1.011	54.19	0.000	39.1	

Table 4. The contribution percentage for relative strength, body mass and height number level for Olympic weightlifting players

Model		Unstandardized Coefficients		Standardized Coefficients			Contribution Rate %	Sum Contribution Rate %
		B	Std. Error	Beta	T	Sig.		
Total	Constant	-1012.89	20.50		-49.39	0.000		
	RS.	80.75	1.74	0.919	46.23	0.000	13.1	94.9
	Height	4.38	0.08	0.765	49.96	0.000	43.2	
	BMI	9.35	0.17	0.997	54.61	0.000	38.6	

Table (3) represents that the height is the first contribution clean & jerk lift performance with the contribution percentage 40.8%, the second contribution is the body mass with contribution percentage was 39%, while the relative strength for working muscles in clean & Jerk lift with contribution percentage 14.9% for that the predictive formula to predict the performance for weightlifting player in clean & jerk lift in Olympic tournaments by indicating relative strength, body mass and height is the performance of clean & jerk lift from weightlifting players= -550.04 + relative strength muscles in clean & jerk lift (79.26) + height (2.39) + body mass (5.10).

Table (4) represents the height is the first contributor in clean & jerk lift performance with contribution percentage 43.2%, body mass is the second contributor with contributing percentage 38.6%, while the relative strength was the third contributor with the contribution percentage 13.1%. So that predictive formula to predict the Olympic weightlifting players number level by indicative relative strength, body mass and height is the number level for weightlifting players =-1012.89 + relative strength (80.75) + height (4.38) + body mass (9.35).

DISCUSSION

The results of the correlation between relative strength, body mass, height and the Olympic weightlifting players performance show table (1) statistical indicative relationship correlation significance level 0.01 between the relative strength, body mass, height and snatch performance. The relative strength agent correlation reach 0.278, while the body mass correlation coefficient 0.701 and the height reached correlation coefficient 0.702, there is statistical indicative relationship correlation between relative strength, body mass and height in clean & jerk lift performance. The relative strength correlation agent reaches -0.368, while the body mass correlation coefficient 0.731. The height correlation agent reaches 0.732, there is a correlation relationship between relative strength, body mass and height in number level sum weightlifting players. So the correlation relative strength agent reaches 0.362, while body mass correlation agent reaches 0.724, also height correlation reaches 0.732. That means that the relative strength in creased, body mass and height the performance of the Olympic weightlifting players increase and also that body weight increase that the body fat mass increase that ratio of the relative strength decrease.

That agrees with Wutscherk (7) he mentions that body weight and mass increased that the weightlifting in snatch and clean & jerk lifts performance increased. That means relationship between body height and the weightlifting player's results. These results of the research agree with some of Ford el al. (6), Ebada (4) and Stone el al. (13) results they provided positive correlation between relative strength and snatch, clean & jerk and number level for weightlifting players.

The table (2, 3, 4) results show differences indicative contribution percentage relative strength, body mass and height reach 7.7%, body mass contribution reached 49.2%, the height contribution reached 37.8% in snatch lift Performance. The body mass contribution percentage also differs from height reached the relative strength 14.9%, while contribution percentage reached for the body mass 39.1%. The height contribution percentages reached

40.8% in Performance clean & jerk lift. From that we conducted contribution percentage of working muscles relative strength in snatch and clean & jerk lifts higher than contributor percentage for working muscles relative strength in snatch and clean and jerk lifts. This higher refers to despite of the same muscles group partnered both lifts for many reasons the first reason is grip kind differences it has been narrowed in clean & jerk lift and it has been wider in snatch lift. The second reason the difference of performance categories so the performance of clean & jerk lift was on to stages. While the performance of snatch lifts was in stage. The third reason the difference of movement mechanics between both lifts. That we get big difference between two lifts in outputs relative strength to overcome the lift weight for the benefit of clean & jerk lift. This agrees with the search results reached El-desoky (2) he found that positive correlations with high contribution percentage between both Olympic lifts and the level number for weightlifting players.

This result agree with what Mochernyuk and Draga (12) mention to relationship between relative absolute strength, body weight and muscles wide sector except for weightlifting player they have high weight, because they head a big amount of fat.

This agrees with what the recent search results reaches it shows indicative statistical relationship between both of relative strength, body mass, height and number level for Olympic weightlifting players. This means on increase of the relative strength for them results to improve the weightlifting players performance. This result becomes agreed with Hare (8), Ford et al. (6), Haleczko (7), Ebada (4), Stone et al. (11) they mention to correlate relationship between absolute relative strength, weight and the performance.

The results of table (4) shows contribution percentage for the relative strength reached 13.1%, while contribution percentage for the body mass 38.6%, also height contribution percentage reached 43.2% in number level for the weightlifting players in Olympics tournaments games. The researcher return these results for depending of development the strength muscles with appropriate with the player height, weight and his body mass very important to raise weight and overcoming the outer resistance for the bar. That results to the relative strength playing basic role in performance and number level. This result agrees with many searches Hollmann and Hettinger (9), Zatsiorsky (18), Ford el al.(6), Ebada (5), Stone el al. (13), Christian (3) they mention for the muscles strength for weightlifting players depending on weight, body mass, height and correlate with number level. So that comparison muscles strength for the player with another complete by using muscles strength parallel for each kg. From

body weight because the relative strength in has very important role for weightlifting players it makes them overcome on weight resistance.

Figures (2) mentions to the relative strength for working muscles in snatch and clean & jerk lifts it contributed in number level for the Olympic players in spite of differences weights and Olympic Games categories. So that the predictive formula to predict the level number for weightlifting players by indicative relative strength and body weight is follows: the level number for the Olympic weightlifting players = the constant amount + relative strength (value) + body mass (value) + height (value).

The researcher sees that there are differences in contribution percentage in number level for the Olympic weightlifting player's by the differences of weight categories, so the relative strength contributed by high percentage in lighter weight categories less than the heaviest weight in level number for the Olympic weightlifting players.

The researcher refers this difference to the heavier weights categories players fat mass is higher than muscles mass, but the lightest weights categories players the muscles mass are higher than the fat mass that results improving the relative strength to allow player from lift maximum weight. This agrees with what Wutscherk (16), Kanyevsky (10) mention to the relative strength in lightest weight categories contributed high degree in snatch and clean & jerk lifts.

This agrees with what Ford el al. (6), Abdel Fattah (1) mention that it is better when developing the maximum strength for weightlifting players to use the nerve organization system through inner and outer consideration nerve between fibers inside the muscle and between muscles groups to increase dynamic and capacity of ATP to prevent the influence of weight result of muscles mass increase, instead of the training by increase side sector muscles that means to increase the weight more than increasing the muscle mass. This result agree with the others searches reaches like Ford el al. (6), Kauhanen et al. (11), Thé and Lori (14), Ebada (4) this researches provided could we predict for level number for weightlifting players by indicative both of the relative strength, weight through the world Championship, and Olympic Games analysis.

CONCLUSIONS

Indicative statistical correlation relationship between relative strength, body mass and height with the level number for Olympic weightlifting players. The relative strength, body mass and height contributes in level number for Olympic weightlifting players so the relative strength contribution percentage reaches 13.1%, contribution percentage for body

mass 38.6%, and contribution percentage height 43.6%. We can predict for level weightlifting players by indicating the relative strength, body mass and height trough this formula: the level number for the Olympic weightlifting players = the constant amount + relative strength (value) + body mass (value) + height (value).).

RECOMMENDATIONS

The importance of muscles strength developing especially the maximum strength for weightlifting players by indicting relative strength indicator and we can make correlate between it, body mass and height. The necessity for using the training methods by the style to increase the muscles strength with prevents and increases the amount of body fat mass. To conclude from correlation relationship between the relative strength mass, height and the level number for the weightlifting players when developing the muscles strength. Applying the research results on weightlifting players predict the level number in world Championships and Olympic Games.

REFERENCES

1. Abdel-fattah, AB.: Sports training Physiology references in physical education and fitness 3, El-fekr Alaraby library, Cairo, 2003.

2. Al-desoky, M.: the contribution percentages in level number for muscles power output of categories of performances for both snatch and clean and jerk lifts for weightlifting players. Master search physical Education of sport, mansora university, 2006.

3. Christian, H.: Objektive Ueberpruefung des kalkulationsmusters der motion power console 500 von der firma emotion fitness zur Ermittlung des startgwichtes beim apparativen krafttraining sowie die Angabe weiterfuehrenden Empfehlungen. Diplomarbeit, kluesserath, Germany, 2007.

4. Ebada, KH.: Growth equation as a mark to the Prediction of Olympic Players results of Weightlifting Sport. The first scientific conference "sport University in Arab countries from 6-7 Feb 2006. Physical Education of sport - Mansoura University, 2006.

5. Ebada, KH.: Die Probleme des Trainings von Gewichthebern kindes- und Jugendalter. Dissertation, Germany, 2003, 60-63.

6. Ford, E., Alvin, J. Detterline, K. ; wenyuan, C.: Gender- and height-related limits of muscle strength in world weightlifting champions. J Appl Physiol, 2000, 89: 1061–1064.

7. Haleczko, A.: Indices of the Relative Strength Fitness of the Disabled Weightlifters. Kinesiology, 2001,11(22): 21-25. ICID: 471754.

8. Hare, D.: Principles of Sports Training Introduction to the Theory and Method of Training", Berlin, 1992.

9. Hollmann, W. and Hettinger, T.: Sportmedizin.4auflage schattauer verlagsgesellschaft mb Hstuttgart, Germany, 2000.

10. Kanyevsky,V.: The Dependence Between the Weightlifter's Absolute and Relative Strength on Weight Class. Translated by Andrew Charniga, Jr. The Russian weightlifting library. Sportivny, Press. Russian. http://www.dynamiceleiko.com /sportivny/ library/news/nv006.html, 2003.

11. Kauhanen, H.; Komi, P.; Häkkinen, K.: Standardization and validation of the body weight adjustment regression equations in Olympic weightlifting. J. Strength Cond. Res. 2002, 16(1):58–74.

12. Mochernyuk, V, Draga V. Determining the Dependence between Weightlifting Results in Different Weight Classes. Translated by Andrew Charniga, Jr. The Russian weightlifting library. Sportivny, Press. Russian. http://www. dynamiceleiko.com/sportivny/library /farti cles 001. html, 2001.

13. Stone, M.; Sands, W.; Pierce, K.; Carlock, J.; Cardinale, M.; Newton, R.: Relationship of Maximum Strength to Weightlifting Performance. Medicine & Science in Sports & Exercise. 2005, 37(6):1037-1043.

14. Thé, D. J.; Lori, P.: Age, Body Mass, and Gender as Predictors of Masters Olympic Weightlifting Performance. Med. Sci. Sports Exercise, 2003, 35(7):1216-1224.

15. Wutscherk, H.: Grundlagen der Sportanthropometrie. Leipzig, 1985.

16. www.IWF.net10/11/2009 PM12:00.

17. www.weightliftingmen\results11/05/2009 PM.10.00.

18. Zatsiorsky, M.: Krafttraining. Praxis und Wissenschaft. Aachen, 2000.