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Impact of body weight on anaerobic power of inter-varsity level Indian weight lifters

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Abstract
The objective of the study was to find out significant difference among the mean scores of Anaerobic Power belonging to different weight categories of Inter-Varsity level Indian Weightlifters. The subjects selected for this study were from Different Indian Universities. One hundred and twenty male weight lifters were selected. Fifteen subjects were selected from each weight Category. Weight categories were considered as independent variable and Anaerobic Power was considered as dependent variable. The anaerobic power was measured by Lewis Nomogram. To find out significant difference among the mean scores of Anaerobic Power belonging to different weight categories of Inter-Varsity level Indian Weightlifters, one way analysis of variance was used at .05 level of significance. By using descriptive statistics, normality was checked. By using levene statistics, homogeneity of variance was tested. To compare paired means, sidak post hoc test was used. Brown-Forsythe and Welch tests were used, since levene statistics was found significant. It was concluded that there was significant difference among the mean scores of Anaerobic Power belonging to different weight categories of Inter-Varsity level Indian Weightlifters.

Keywords: Anaerobic power, Indian Inter-Varsity weight lifters.

Introduction
Weightlifting is a popular sport that requires strength. But if we talk about the specific type of strength, this sport requires explosive strength. Explosive strength is associated with Anaerobic Capacity of any individual. It can also be said that Anaerobic Capacity contributes to the performance of Weightlifting.
Another characteristic of the sport Weightlifting is that competitions are organized on the basis of weight categories. Weightlifters of different weight categories require different level of Anaerobic Power. Investigators made efforts in this study to investigate the impact of weight categories of Anaerobic Power by comparing Anaerobic Power in different weight categories.

Objective of the study
The objective of the study was to find out significant difference among the mean scores of Anaerobic Power belonging to different weight categories of Inter-Varsity level Indian Weightlifters.

Selection of subjects
The subjects selected for this study were from Different Indian Universities. One hundred and twenty male weight lifters were selected. Fifteen subjects were selected from each weight Category.

Variables
Weight categories were considered as independent variable and Anaerobic Power was considered as dependent variable.

Criterion measure

Variable	Test used	Unit of measurement
Anaerobic power	Lewis Nomogram	Kg-m/sec

Statistical Analysis

To find out significant difference among the mean scores of Anaerobic Power belonging to different weight categories of Inter-Varsity level Indian Weightlifters, one way analysis of variance was used at .05 level of significance. By using descriptive statistics, normality was checked. By using levene statistics, homogeneity of variance was tested. To compare paired means, sidak post hoc test was used. Brown-Forsythe and Welch tests were used, since levene statistics was found significant.

Table 1: Descriptive statistics related to Anaerobic Power of different weight category Weightlifters

Weight Categories			Statistic	Standard Error
56 kilogram weight category	Mean		92.53	1.05
	95% Confidence Interval for Mean	Lower Bound	90.26	
		Upper Bound	94.80	
	Skewness		-.28	.58
	Kurtosis		-1.72	1.12
62 Kilogram weight category	Mean		95.93	2.17
	95% Confidence Interval for Mean	Lower Bound	91.26	
		Upper Bound	100.59	
	Skewness		.12	.58
	Kurtosis		-1.26	1.12
69 kilogram weight category	Mean		115.06	1.81
	95% Confidence Interval for Mean	Lower Bound	111.16	
		Upper Bound	118.96	
	Skewness		-1.70	.58
	Kurtosis		1.98	1.12
77 kilogram weight category	Mean		127.80	.93
	95% Confidence Interval for Mean	Lower Bound	125.80	
		Upper Bound	129.79	
	Skewness		-1.03	.58
	Kurtosis		.61	1.12
85 kilogram weight category	Mean		142.06	2.01
	95% Confidence Interval for Mean	Lower Bound	137.74	
		Upper Bound	146.38	
	Skewness		-.48	.58
	Kurtosis		-1.00	1.12
94 kilogram weight category	Mean		152.73	2.02
	95% Confidence Interval for Mean	Lower Bound	148.38	
		Upper Bound	157.08	
	Skewness		-.97	.58
	Kurtosis		.26	1.12
105 kilogram weight category	Mean		160.73	3.68
	95% Confidence Interval for Mean	Lower Bound	152.82	
		Upper Bound	168.63	
	Skewness		-.36	.58
	Kurtosis		-1.40	1.12
above 105 kilogram weight category	Mean		164.86	2.82
	95% Confidence Interval for Mean	Lower Bound	158.80	
		Upper Bound	170.92	
	Skewness		.71	.58
	Kurtosis		-.34	1.12

It is evident from table-1 that in 56 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 92.53, 1.05, 90.26, 94.80, .28, .58, 1.72 and 1.12 respectively.

It is evident from table-1 that in 62 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 95.93, 2.17, 91.26, 100.59, .12, .58, 1.26 and 1.12 respectively.

It is evident from table-1 that in 69 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 115.06, 1.81, 111.16, 118.96, .1.70, .58, 1.98 and 1.12 respectively.

It is evident from table-1 that in 77 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 127.80, .93, 125.80, 129.79, 1.03, .58, .61 and 1.12 respectively.

It is evident from table-1 that in 85 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 142.06, 2.01, 137.74, 146.38, .48, .58, 1.00 and 1.12 respectively.
It is evident from table-1 that in 94 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 152.73, 2.02, 148.38, 157.08, .97, .58, .26 and 1.12 respectively.
It is evident from table-1 that in 105 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 160.73, 3.68, 152.82, 168.63, .36, .58, 1.40 and 1.12 respectively.
It is evident from table-1 that in above 105 kilogram weight category mean, standard error of mean, lower bound of 95% confidence interval of mean, upper bound of 95% confidence interval of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis were 164.86, 2.82, 158.80, 170.92, .71, .58, .34 and 1.12 respectively.

Table 2: Levene statistic related to Anaerobic Power of different weight category Weightlifters

Test of Homogeneity of Variances			
Anaerobic Power			
Levene Statistic	df1	df2	Sig.
8.78	7	112	.00

Table-2 reveal that levene statistic was found significant at .05 level. Since this value was found significant, Brown-Forsythe and Welch tests were used.

Table 3: Analysis of variance related to Anaerobic Power of different weight category Weightlifters

Anaerobic Power					
	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	83963.33	7	11994.76	160.83	.00
Within Groups	8352.53	112	74.57		
Total	92315.86	119			

Table-3 reveal that F-value of 160.83 was found significant at .05 level of significance. But it cannot be said that significant difference was found among different weight category in Anaerobic Power since levene statistic was found significant.

Table 4: Results of Brown-Forsythe and Welch tests related to Anaerobic Power of different weight category Weightlifters

Tests	Statistic[a]	df1	df2	Sig.
Welch	214.19	7	47.20	.00
Brown-Forsythe	160.83	7	69.94	.00

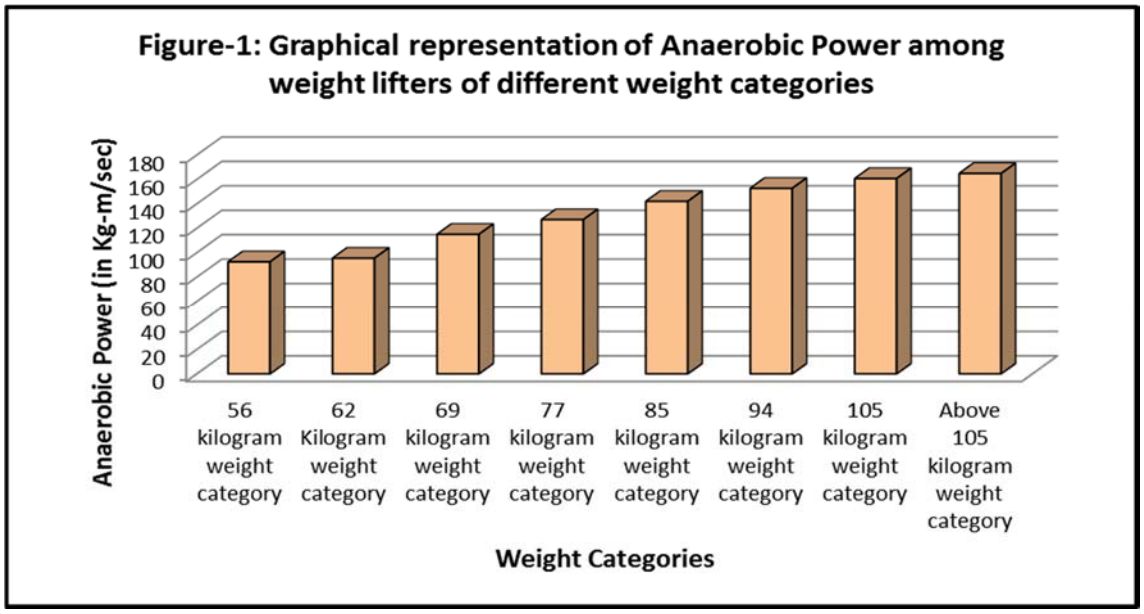
Table-4 shows the results of Brown-Forsythe and Welch tests. Both the tests were applied, since levene statistic was found significant at .05 level. This shows that the assumption of homogeneity of variance was broken. Since value of Welch (214.19) and Brown-Forsythe (160.83) were found significant, difference among the different weight categories in Anaerobic Power was significant.

Table 5: Sidak post hoc test to compare paired means related to Anaerobic Power of different weight category Weightlifters

(I) Weight Categories	(J) Weight Categories	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
56 kilogram weight category	62 Kilogram weight category	-3.40	3.15	1.00	-13.46	6.66
	69 kilogram weight category	-22.53	3.15	.00	-32.60	-12.46
	77 kilogram weight category	-35.26	3.15	.00	-45.33	-25.19
	85 kilogram weight category	-49.53	3.15	.00	-59.60	-39.46
	94 kilogram weight category	-60.20	3.15	.00	-70.26	-50.13
	105 kilogram weight category	-68.20	3.15	.00	-78.26	-58.13
	above 105 kilogram weight category	-72.33	3.15	.00	-82.40	-62.26
62 Kilogram weight category	69 kilogram weight category	-19.13	3.15	.00	-29.20	-9.06
	77 kilogram weight category	-31.86	3.15	.00	-41.93	-21.79
	85 kilogram weight category	-46.13	3.15	.00	-56.20	-36.06
	94 kilogram weight category	-56.80	3.15	.00	-66.86	-46.73
	105 kilogram weight category	-64.80	3.15	.00	-74.86	-54.73
	above 105 kilogram weight category	-68.93	3.15	.00	-79.00	-58.86
69 kilogram weight category	77 kilogram weight category	-12.73	3.15	.003	-22.80	-2.66
	85 kilogram weight category	-27.00	3.15	.00	-37.06	-16.93
	94 kilogram weight category	-37.66	3.15	.00	-47.73	-27.59
	105 kilogram weight category	-45.66	3.15	.00	-55.73	-35.59
	above 105 kilogram weight category	-49.80	3.15	.00	-59.86	-39.73
77 kilogram weight category	85 kilogram weight category	-14.26	3.15	.00	-24.33	-4.19
	94 kilogram weight category	-24.93	3.15	.00	-35.00	-14.86
	105 kilogram weight category	-32.93	3.15	.00	-43.00	-22.86
	above 105 kilogram weight category	-37.06	3.15	.00	-47.13	-26.99
85 kilogram weight category	94 kilogram weight category	-10.66	3.15	.02	-20.73	-.59
	105 kilogram weight category	-18.66	3.15	.00	-28.73	-8.59
	above 105 kilogram weight category	-22.80	3.15	.00	-32.86	-12.73
94 kilogram weight category	105 kilogram weight category	-8.00	3.15	.29	-18.06	2.06
	above 105 kilogram weight category	-12.13	3.15	.006	-22.20	-2.06
105 kilogram weight category	above 105 kilogram weight category	-4.13	3.15	.99	-14.20	5.93
*. The mean difference is significant at the 0.05 level.						

Table-5 reveal that significant different was found between the means of 56 kilogram weight category and 69 kilogram weight category; 56 kilogram weight category and 77 kilogram weight category; 56 kilogram weight category and 85 kilogram weight category; 56 kilogram weight category and 94 kilogram weight category; 56 kilogram weight category and 105 kilogram weight category; 56 kilogram weight category and above 105 kilogram weight category; 62 kilogram weight category and 69 kilogram weight category; 62 kilogram weight category and 77 kilogram weight category; 62 kilogram weight category and 85 kilogram weight category; 62 kilogram weight category and 94 kilogram weight category; 62 kilogram weight category and 105 kilogram weight category; 62 kilogram weight category and above 105 kilogram weight category; 69 kilogram weight category and 77 kilogram weight category; 69 kilogram weight category and 85 kilogram weight category; 69 kilogram weight category and 94 kilogram weight category; 69 kilogram weight category and 105 kilogram weight category; 69 kilogram weight category and above 105 kilogram weight category; 77 kilogram weight category and 85 kilogram weight category; 77 kilogram weight category and 94 kilogram weight category; 77 kilogram weight category and 105 kilogram weight category; 77 kilogram weight category and above 105 kilogram weight category; 85 kilogram weight category and 94 kilogram weight category; 85 kilogram weight category and 105 kilogram weight category; 85 kilogram weight category and above 105 kilogram weight category; 94 kilogram weight category and above 105 kilogram weight category; 105 kilogram weight category and above 105 kilogram weight category.

On the other hand, insignificant difference was found between the means of 56 kilogram weight category and 62 kilogram weight category; 94 kilogram weight category and 105 kilogram weight category & 105 kilogram weight category and above 105 kilogram weight category.



Discussions

Significant difference was found among the different weight categories of Weightlifters. This might be due to the reason that in different weight categories, there is a difference in body composition. Same type of study was conducted by Chahal, V., Kumar, P., & Choudhary, R. (2000) [2] on University level Weightlifters. Since there is a difference in the level of the subjects of present study, investigators decided to conduct this study. Previous study shows the significant difference among different weight categories. The Weightlifters of high weight category possessed high level of Anaerobic Power in comparison of low weight category. Present study also followed the same trend. It may be concluded that the level of Weightlifters does not affect the different level of Anaerobic Capacity possessed by the Weightlifter of different weight categories.

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