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A Comparative Study of height of Center of Gravity and Anthropometric Variables Related to Balance of Judo Players in Comparison to Performance

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Abstract – The purpose was to study a comparison of height of center of gravity and anthropometric variables related to balance of judo players in comparison to performance . The data was collected using portable electronic weighing machine and anthropometric rod for weight and height respectively. To measure the height of center of gravity standardized methods explained and recommended by H.S.Sodhi (1980), Das and Ganguli (1982), H. Clark (1987), Watthew and Fox (1981) etc. was adopted.. To meet the objectives of the study following statistics have been computed (1) Mean (2).Standard deviation (3) percentage . Hypothesis was tested at 0 .0 5 level of significance. The judo weight categories were found to be significantly different in regard to selected variables, namely percentage height of center of gravity, height of c.g, height, weight. All the weight categories of judo players demonstrated significant relationship between weight and performance ranking among the selected balance related variables namely height, center of gravity and percentage height of gravity.

Key words: Center of gravity, Judo performance, Comparative study.

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INTRODUCTION

Judo is derived from Jujutsu. It was created by Professor Jigoro Kano, who was born in Japan on October 28, 1860. In his youth Kano studied Jujutsu under a number of different masters. Sensei Teinosuke Yagi was his first teacher, but at the age of 18 he entered the dojo of Tenshin-Shinyo Sens ei Hachinosuke Fukuda. Upon graduation from Tokyo University, he studied the Kito tradition under Sensei Iikubo. By his mid-twenties, Shihan Kano had been initiated into the secret teachings of both ryus

A major change in Judo was the introduction of weight categories for the Olympic Games in 1964. Until then world championships were open to all weights in one category, but starting with the Tokyo Olympics 3 weight categories (-68 kg, -80 kg, +80 kg) were introduced in addition to the open category. The categories were expanded to 6 (including an open weight category) for the 1968 Olympics and 8 for the 1980 Olympics. In 1992 the open weight category was dropped from the Olympics so there are currently 7 weight categories for both men and women in the Olympics. The world championships continue to include the open weight category as well.

Weight classes are divisions of competition used to match competitors against others of their own size. This reduces the exclusion of smaller athletes in sports where physical size gives a significant advantage. Weight classes are used in a variety of sports, especially combat sports (such as boxing, judo, wrestling, and mixed martial arts).

Physical educators have long realized that the performance of boys and girls is greatly influenced by such factors as age, height, weight, body structure. It is also acknowledged that persons of the same age will vary considerably in body size and shape; that individuals of the same height will differ greatly in body weight; that persons may weight the same, but the relative proportion c muscle, fat, and bone will be anything but equal. It is obvious, then, that n single measure by itself is satisfactory for the purposes of classifying student e into homogenous groups.

In judo it is important to throw your opponent by making use of his loss of balance; the law at work here is the law of gravity. We know that Sir Isaa Newton discovered the law of gravitation by seeing an apple fall from a tree. All bodies in the universe attract one another. For instance, the earth attracts

the bodies near and around it. In turn they also pull the earth.

Since the power of attraction, according to Newton, is proportional to the mass of the body that attracts, the larger the mass of the body, the larger it attraction. All bodies near the earth fall to the earth because it has an immense mass. An airplane or a bird starts to fall to the ground as soon as its power o flight is exhausted. The force of attraction between the earth and a two-pound weight is twice that between the earth and a one-pound weight.

Height is also an important component because above explained all anthropometric variables are directly related to height and weight. If height increases the length of all other body parts length by and large increases and also affects the circumferences, **centre of gravity** as well.

OBJECTIVES

- To investigate the relationship between judo performance ranking and percentage height of center of gravity and selected balance related anthropometrics variables according to weight category.

- To compare among the selected categories (upto 56 kgs, above 56kgs upto 60 kgs, above 60 kgs upto 66 kgs, above 66kgs upto 73kgs, above 73kgs upto 81kgs, above 81 kgs upto 90 kgs, above 90 kgs upto 100kgs, above 100 kgs upto open weight category) in regard to there Percentage height of center of gravity, Height of C.G, Height, Weight.

HYPOTHESES

It was hypothesized that:

The percentage height of center gravity and selected balance related **anthropometric** variables of male judo players belonging to different weight categories (up to 56 kgs, above 56kgs up to 60 kgs, above 60 kgs up to 66 kgs, above 66kgs up to 73kgs, above 73kgs up to 81kgs, above' 81 kgs up to 90 kgs, above 90 kgs up to 100kgs, above 100 kgs up to open weight category) will be significantly different.

The percentage height of center gravity and selected balance related anthropometrics variables of male judo players belonging to different weight categories (up to 56 kgs, above 56kgs up to 60 kgs, above 60 kgs up to 66 kgs, above 66kgs up to 73kgs, above 73kgs up to 81kgs, above 81 kgs up to 90 kgs, above 90 kgs up to 100kgs, above 100 kgs up to open weight category) will be significantly related to their judo performance.

DELIMITATIONS

- The Study of height of center of gravity had been delimited to following weight groups(Below 56 kgs, above 56kgs up to 60 kgs, above 60 kgs up to 66 kgs, above 66kgs up to 73kgs, above 73kgs up to 81kgs, above 81 kgs up to 90 kgs, above 90 kgs up to 100kgs, above 100 kgs up to open weight category)

- The study was delimited to the Delhi (NCR) for sampling purposes.

- The study was delimited to randomly selected thirty males from each weight categories.

- The study was delimited to total number of subject was 240 judo player.

LIMITATIONS

- None-availability of sophisticated equipments considered as one limitation of the problem.

- Limited number of subjects in each weight categories being considered the nature of the study may be considered as limitation of the study due to feasibility factors.

SELECTION OF SAMPLES

The total numbers of samples were 240 randomly selected male judo players belonging to different weight categories (Below 56 kgs, above 56kgs up to 60 kgs, above 60 kgs up to 66 kgs, above 66kgs up to 73kgs, above 73kgs up to 81kgs, above 81 kgs up to 90 kgs, above 90 kgs up to 100kgs, above 100 kgs up to open weight category) fro m the area of NCR (National Capital Region). Samle size in each category is 30.

SELECTION OF VARIABLES

Selections of variables are made on the basis of their importance anthropometrically as well as with the consultation of experts the following variables were focused:

- Percentage height of center of gravity (%)
- Height of C.G (cm)
- Height (cm)
- Weight (kg)

COLLECTION OF DATA

Various scientific equipments were used to collect the data such as portable electronic weighing machine and anthropometric rod for weight and height respectively. To measure the height of center of gravity standardized methods explained and recommended by H.S.Sodhi (1980), Das and Ganguli

(1982), H. Clark (1987), Watthew and Fox (1981) etc. was adopted. For percentage height and height of center of gravity the procedure explained by Shaw (1998) was adopted· Judo performance ranking was determined by round robin method.

STATISTICAL ANALYSIS:

Keeping in mind the purposes and objectives of the study following statistics have been computed (1) Mean (2).Standard deviation (3) percentage . The level of significance was set at .05 level to test the drawn hypothesis.

Discussion on Findings

Comparison among the Weight Categories in Regard to Selected Anthropometric Variables

Variables	Source	Sum of Squares	df	Mean Square	F
	Between	7103.74		014.82	9.41*
Height	Groups				
	Within	335.28	46	5.75	
	Groups				
	Total	3439.02	53		
	Between	2590.01		0370.00	370.56*
Weight	Groups				
	Within	861.30	46	.57	
	Groups				
	Total	4451.31	53		
	Between	88.45		8.35	2.41'
Ponderal Index	Groups				
	Within	87.64	46	.58	
	Groups				
	Total	076.10	53		
	Between	.45		.06	5.99*
Center of	Groups				
	Within	.00			
Gravity			46	.00	
	Groups				
	Total	.45	53		
Percentage	Between	09.68		9.95	.77*
Height of Center	Groups				
	Within	662.12	46	0.82	
of Gravity	Groups				
	Total	871.89	53		

* Significant at .05 level

The comparison among the judo player belonging to weight categories (up to 56kgs, above 56kgs up to 60kgs, above 60kgs up to 66kgs, above 66kgs up to 73kgs, above 73kgs up to 81kgs, above 81kgs up to 90} above 90kgs up to 100kgs, above 100kgs up to open) in regard to height (F=39.41), weight (F = 1370.56), ponderal index (F = 62.41), center of gravity (F -- 15.99), Percentage height of center of gravity (F = 2.77) found to be statistically different at .05 level of significance, hence accepted the drawn hypothesis.

The second hypothesis of the study was "The percentage height of center gravity and selected balance related anthropometrics variable § of male judo players belonging to different weight categories (up to 56 kgs, above 56kgs up to 60 kgs, above 60 kgs up to 66 kgs, above 66kgs up to 73kgs, above 73kgs up to 81kgs, above 81 kgs up to 90 kgs, above 90 kgs up to 100kgs, above 100 kgs up to open weight category) will be significantly related to their judo performance". The correlation matrix of judo performance and selected balance related anthropometric variable and percentage height of gravity of up to 56 kgs weight category presented in documents that there was significant relationship between height and center of gravity (r = .803); weight and percentage height of center of gravity (r = -.400); weight and performance (r = .618); center of gravity and percentage height of center of gravity (r -.826) at .05 level, hence accepted the drawn hypothesis.

Where as insignificant relationship was observed between height and weight (r = 0.14); height and percentage height of center of gravity (r = 0.328); height and performance (r = 0.017it-- weight and center of gravity (r = -0.167); center of gravity and performance (r = -0.152); percentage height of center of gravity and performance (r = -0.265) at .05 level, hence rejected the drawn hypothesis.

CONCLUSIONS

The judo weight categories were found to be significantly different in regard to selected variables, namely percentage height of center of gravity, height of c.g, height, weight.

All the weight categories of judo players demonstrated significant relationship between weight and performance ranking among the selected balance related variables namely height, center of gravity and percentage height of gravity.

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