A Study to Determine the Impact of anthropometric Variables, Physical Fitness Variables and Physiological Parameters on the Performance of Grapplers

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Abstract: **The current study investigates the impact of anthropometric, physical fitness, and physiological parameters on the performance of grapplers. Grappling sports, such as wrestling and mixed martial arts, require a unique blend of strength, endurance, and technical expertise. Understanding the relationship between these key parameters and the performance of grapplers can provide valuable insights for optimizing training programs and enhancing competitive outcomes. A total of 150 male grapplers from various skill levels and competitive backgrounds were selected as participants for this research. Anthropometric measurements, physical fitness and Physiological parameters are measured to assess the athletes' physical capabilities. The findings of this study revealed significant associations between certain anthropometric, physical fitness, and physiological parameters with grapplers' performance. For instance, athletes with higher grip strength and explosive strength demonstrated better takedown abilities, while those with superior aerobic fitness exhibited greater endurance during prolonged matches. Moreover, the study identified specific anthropometric characteristics that were advantageous for particular grappling techniques and strategies. Understanding these impacts can assist coaches and athletes in tailoring training regimens and developing specialized skills to gain a competitive edge. Additionally, the study sheds light on the crucial role of anthropometric, physical fitness, and physiological parameters in influencing the performance of grapplers. The insights gained from this study can aid in optimizing training approaches and talent identification programs, ultimately leading to improved competitive outcomes for grapplers at various skill levels. Further research in this area can continue to contribute to the advancement of grappling sports and athlete development.**

Keywords: anthropometric Variables, Physical Fitness Variables, Physiological Parameters, Performance of Grapplers

I. Introduction

The modern world appears to be much more concerned with the word of sports. The hold of sports has grown very strongly on the mind of individuals in the society at large. Now, people all around the world are familiar with the word sports and sportsman and whole world knows the significance of Sports. Entire world is engaged in developing sports in their country. There will be hardly any individual who has been deprived of its impact in the developed countries of the world. Sports have become the matter of pride for the world. Now winning the competitions involves the national prestige as each nation strives to win a tournament in which they compete. There are number of nations which try to project the superiority of their political ideology and socio-political system through spectacular achievements in the sports world. They show their excellence by winning the maximum number of medals in all the international competitions.

Sport refers to a playful self-development, self-actualization, and competitive use of physical and mental skills. The history of sport activities is as long as the history of humans. Most civilizations know sport activities of an elementary nature running, boxing, wrestling, animal fights, horse races, throwing the javelin, the discus, or stones, archery, swimming, dancing, etc. No wonder contemporary players and fans still find sports very attractive. The development of sports from pre-historic times until now is a function of industrialization, modernization, and telecommunication. Sports provide reliable mirrors of societies. They reflect social values that can extend from individual values like discipline, asceticism, and self-control to collective values like sportsmanship and fairness, and

generally accepted values like the belief in effort and productivity, the advantage of competition, and—following the logic of capitalism—the survival of the fittest. Sports also act as seismographs of social and cultural changes within social units of any size. They are strongly linked to the prevailing lifestyles in modern societies. Sports, to a certain degree, can even replace a function of religions by defining a specific set and hierarchy of values. Sports are integrative and image building elements for individuals, segments of societies, and entire societies.

II. History of Wrestling

About 5000 years ago, the first real traces of wrestling were found in the times of the Sumerians. In ancient Egypt too, many historical and archaeological traces of wrestling were found. Wrestling in India is most famously known as Malla-Yuddha. Some forms of Mallayuddha were practiced in India even before the invasion of the Aryan. The famous Indian epic, Mahabharata has a huge mention about the game of Wrestling in India. One of the premier characters in Mahabharata, Bhima was considered to be a great Wrestler of that time and some of the other great wrestlers included Jarasandha, Duryodhan, Kama etc. In the other Indian epic, Ramayana also mentions about Wrestling in India and Hanuman is described as one of the greatest wrestlers of that time. The thirteenth century MailaPurana has the reference of a group of Gujarati Brahmin wrestlers known as Jyesthimallas. Wrestling in India, during the ancient times, used to get regular patronage from the Emperors and Kings. The kings of pre independence nurtured Wrestling in India to a large extent. The Indian Kings used to keep the wrestlers in good diet and provide them with pulses, meat, milk, sugar and high-quality sweets. The wrestlers used to keep themselves engaged inside the wrestling court and concentrate on bodybuilding, all the time. The Indian Kings had many stables and 'court' wrestlers, who represented them against the wrestlers of their rival Kings during the British rule. Wrestling in India got another big push, as the British rulers included the game into the military practice. The British military including Indian soldiers got attracted to wrestling, very much (Nitesh, 2015).

Kendall (1995) reported that a carving on a stone stable showing three pairs of wrestlers was dated to around 3000 BC. Evidences showing wrestlers in action were found in Egyptian burial chamber, from the tomb of Khnumhotep and Niankhkhnum dating to around 2400 BC (Egypt thomb, 2011). It was also reported that during 2000-1085 BC, Egyptian art-work (often on friezes) showed Egyptian and Nubian wrestlers competing. In the Mahabharata too, the encounter between Bhima and Jarasandha gives ample evidence practicing wrestling in ancient India. In fact, practicing wrestling was an important training protocol as martial arts among the princes in ancient India. Professional wrestling began in France around in 1830. In that time, showmen used to present wrestlers under the name like "Edward, the steel eater", "Gustav d' Avignon, the bone wrecker", or "Bonnet, the ox of the low Alps" and challenged anyone from the public to knock them down for 500 francs. In 1848,French showman Jean Exbroyat establish the first modern wrestler's circus troupe, forming the rule as not to execute holds below the waist. He named the new style as flat hand wrestling. The French influence extended to Austrian Hungarian empire, to Italy, Denmark and Russia, and the new style circulated under the name of Greco-roman wrestling. Professional wrestling became very popular in Europe at the end of the 19th century. But the degradation of the popularity started from 1900, in early Europe, probably due to exposure of forgery, false victories. The prearrangement of matches, and faulty nationalities of the wrestlers.

III. Research Methodology

The aim of the study was to explore the role of anthropometric, physical fitness variables and physiological parameters and, the performance of the grapplers of Greco-Roman and free style sport, how these variables might contribute to the grapplers' overall performance in their respective wrestling styles. A survey was conducted to collect the data on anthropometric variables, physical fitness variables, and physiological parameters of Greco-Roman and free style grapplers. The present study is mainly based on primary data. Primary data is collected from Free style and Greco-roman grapplers from different academies and Akharas of various districts of Haryana. The data has been collected from academy with the help of Coaches and Managers. Quantitative information has been collected to explore details related Anthropometric variables, Physical fitness variables and Physiological parameters from the Greco-Roman and Free style grapplers.

The descriptive statistics are used to understand the body profile of the respondents. Cross-tabulation is done to analyse the variations and association across different weight categories of Greco-roman and Free style grapplers. Statistical tools are used to examine the performance of grapplers. Moreover, bi-variate tables are carried out to study the association between selected covariates and the outcome variables. Logistic regression is used to understand the relationship between performance of Free-style and Greco-roman grapplers with their anthropometrics, physical fitness and physiological parameters. The performance is classified into medallist grapplers and non-medallist grapplers category. A grappler who won gold and silver medal at inter-college, or above high competition like inter university, senior national and international level includes in medallist category. Rest of grapplers includes in non-medallist category.

IV. Results and Discussion

Impact of Anthropometric, Physical fitness and Physiological parameters on Performance of Free style and Greco-roman Grapplers

One of the central concerns is how the Anthropometrical measurement, Physical efficiency of body and Physiological

increases by a unit, then the odds of achieving position/medal increase by a whooping of 327 times. Similarly, Back strength of grapplers has a positive impact on achieving position/medal, as Back strength increases by a unit, then the odds of achieving position/medal increases by five percent.

Reaction time has a negative impact on achieving position/medal, when Reaction time increases by a unit, then the odds of achieving position/medal decreases by 51 percent (table 2).

Table 2: Binary Logistic Regression of Physical Fitness Variables of Free style and Greco-roman Grapplers

Physical Fitness Variables	B	S.E.	Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
Constant	-15.789***	4.748	.000		
Explosive Strength (Standing broad jump) (mtr)	5.791***	1.699	327.463	11.730	9141.902
Flexibility (Sit and Reach Test) (cm)	.038	.060	1.038	.922	1.169
Grips Strength (right hand) (kg)	.075	.054	1.077	.970	1.197
Grips Strength (left hand) (kg)	.034	.053	1.035	.932	1.149
Back Strength (kg)	.044**	.019	1.045	1.006	1.085
Reaction Time (cm)	-.717***	.147	.488	.366	.651

Source: Calculated from field survey
Note: "***", "**" and "*" indicate $p<0.01$, $p<0.05$, $p<0.10$ respectively

Physiological Efficiency

Physiological efficiency and performance of Free style and Greco-roman grapplers

Further, another binary logistic regression is applied to identify the relationship between Physiological efficiency and performance of Free style and Greco-roman grapplers. Results on the odds ratio along with the coefficients are shown in the table 3.

Results indicate that other things remaining same, the odds of medal achievement significantly determined by the Physiological parameters such as Vital capacity and Heart rate. For example, Vital capacity has a positive impact on achieving position/medal, when Vital capacity increases by a unit, then the odds of achieving position/medal increase by a factor of about five. However, Heart rate has a negative impact on achieving position/medal, as Heart rate increases by a unit, then the odds of achieving position/medal by Greco-roman grapplers decreases by 31 percent (table 3).

Table 3: Binary Logistic Regression of Physiological Parameters of Free style and Greco-roman Grapplers

Physiological Parameters	B	S.E.	Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
Constant	14.810***	5.664	51406.968		
Vital Capacity (ltr)	1.684***	.477	5.385	2.116	13.705
Maximum Inspiratory Breath Hold Capacity (sec)	.046	.046	1.047	.957	1.145
Maximum Expiratory Breath Hold Capacity (sec)	.007	.050	1.007	.914	1.110
Heart Rate (Beat/min)	-.390***	.073	.677	.587	.781
Systolic BP	.013	.024	1.013	.967	1.062
Diastolic BP	.031	.034	1.032	.965	1.103

Source: Calculated from field survey
Note: "***", "**" and "*" indicate $p<0.01$, $p<0.05$, $p<0.10$ respectively

V. Conclusion

The findings of this study disclose the challenges confronting the coaches and sport scientists to understand the anthropometrical, physical and physiological factors contributing to successful wrestling. The use of physical fitness tests for the measurement of the current status of the wrestler can provide both the wrestler and coach with information relative to the wrestler's current physiologic capability and can allow them to compare that capacity with reference values from appropriate peer groups. Furthermore, the assessment of current status reveals strengths and relative

weaknesses, and can become the base for the development of an optimal training program. The study may certainly help coaches and other technical people in the field of active sports science to get a impartial idea of the physiological status for young players in order to formulate and monitor their future training programs.

Binary logistic regression is applied to identify the relationship between Anthropometrical measurement and performance of Free style and Greco-roman grapplers. Results indicate that the odds of medal achievement depend substantially on Anthropometric variables such as size of Biceps and Supra-iliac.

Additionally, binary logistic regression is applied to identify the relationship between Physical fitness variables and performance of Free style and Greco-roman grapplers. Results on the odds ratio show the similar outcome as recognises in previous analysis. The odds of medal achievement depend substantially on Physical fitness variables such as Standing broad jump, Back strength and Reaction time.

Further, binary logistic regression is applied to identify the relationship between Physiological efficiency and performance of Free style and Greco-roman grapplers. Results indicate that other things remaining same, the odds of medal achievement significantly determined by the Physiological parameters such as Vital capacity and Heart rate.

VI.   REFERENCES

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