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Examination of the Relationship between Anthropometric Characteristics of Elite Wresters and Their Strength and Vertical Jump Performance

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Abstract

The aim of this study was to examine the relation between certain anthropometric characteristics and strength and vertical jump performance of elite wrestlers. 16 athletes wrestling in different clubs participated in our research. Average age of the wrestlers was 23,62 ± 244, while their average height was 177,31 ± 5,18 and their average weight is 86,45 ± 14,91. In determining the anthropometric measurements of the subjects, height, body weight, skin fold thickness, circumference and diameter measurements were made. For measurement of strength parameters, claw strength was measured with a Takkei brand hand dynamometer, while back and leg strength was measured with a back and leg dynamometer. An electronic smart speed lite system was used to measure the vertical jump performance of the athletes. Pearson Correlation Analysis was used to determine the relationship between anthropometric measurements and strength parameters and vertical jump ratios, and values with $p < 0,05$ were considered significant. As a result, the relationship between anthropometric characteristics and physical performance of elite wrestlers was examined, and a high correlation was found between anthropometric measurements and strength parameters. There was no relationship between vertical jump and anthropometric measurements and strength parameters. In addition, it is a remarkable detail that no significant difference could be detected between the leg, back, right and left claw strengths of wrestlers and their anthropometric characteristics.

Key Words: Leg-back strength, claw strength, anthropometry, vertical jump, wrestling

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1. INTRODUCTION

Wrestling is not only a fight consisting of tricks to beat the opponent, but also a sport that requires sportive performance and control such as high levels of endurance (aerobic, anaerobic, respiratory functions), strength, flexibility, speed, quickness, balance, reaction and strategy (Yoon 2002). However, Wrestling is also defined as a sport branch in which anaerobic energy system is used predominantly and factors such as speed, strength, quickness, flexibility, balance, muscular and cardiovascular endurance and coordination affect the performance (Akgün 1992, Baykuş 1989, Johnson and Cisar 1987).

Studies conducted show that having certain body sizes provides advantages to certain skills in sports (Kurudirek 1998). There is a close relationship between sportive performance and body type (Carter 1970). This relationship attracts the attention of sports scientists and constitutes the main purpose of many studies (Heyward and Stolarcyk 1996, Doğu and Zorba 1990).

Improvement of a parameter that affects performance in sports branches affects the improvement of another performance parameter. For example, improving aerobic capacity as a training principle is a prerequisite for improving anaerobic capacity. Because aerobic training is also a preliminary preparation for anaerobic loading and "high levels of aerobic capacity positively transform into anaerobic capacity." (Kartal and Günay, 1994). Also, an ability or performance in any sport can be affected for neuromuscular, mental and metabolic reasons (Kerem and Ceylan, 2020). In addition to this information, Physical and physiological characteristics are reported to be correlated with each other in most studies (Özkan et al., 2009; Aslan et al., 2007; Inskip et al., 2007; Özkan and Sarol, 2007; Silvestre et al., 2006; Aslan, 2008).

One of the factors affecting performance in sports is the physical structure, in other words, physical characteristics of the person. These features affect the individual revealing his/her physiological capacity. Unless the available physical structure is suitable for the relevant sport branch, it is not possible to achieve a high level of performance. Physical structure is one of the necessary features for athletes to show a high level of performance. However, certain performance indicators such as strength, force, flexibility, speed, endurance and quickness can positively affect the performance of athletes (Açıkada and Ergen 1990, Özkan et al. 2005).

In sports sciences, leg strength, jump, flexibility and anaerobic strength were measured collectively or separately in many studies conducted to our day, and in some of these studies, both the relation between said parameters and how these parameters were affected from physical characteristics were examined. In these studies, it was generally reported that anaerobic performance parameter was highly affected from age, sex, muscle type and muscle mass, genetics, body composition and training (Bouchard et al., 1991). The purpose of this study in the light of these information is to examine the relation between certain anthropometric characteristics and strength and vertical jump performance of elite wrestlers. In this context, following questions will be answered in our study as a result of the tests applied to elite national team athletes;

1. What is the relationship between vertical jumps and strength parameters?

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2. What is the relationship between vertical jumps and anthropometric measurements?
3. What is the relationship between certain strength parameters and their anthropometric measurements?

2. MATERIAL METHOD

2.1 Research Group

16 wrestling athletes who were competing at national teams level participated in the study voluntarily. The average age of the wrestlers participating in the study is 23,62 ± 2,44. Wrestlers were included in the study randomly, the study to be carried out was explained to each participant in detail, and the informed volunteer form was approved. Then, participants' height, body compositions, vertical jump performances, hip and waist circumference measurements, leg, back and hand grip strengths (right-left) were assessed and recorded respectively. Measurements were taken from all participants under equal conditions and before training.

2.2. Measurements

Weight Measurement: Subjects were measured with a 100 gr Salus brand (Salus, Milan, Italy) scale with bare feet and swimwear, in a tall position, standing still and without support.

Height Measurement: Subjects were measured with Salus brand (Salus, Milan, Italy) stadiometer with an accuracy of 0,001 m with their heads held high, eyes facing forward and heels adjacent.

Skinfold Measurements: Skinfold measurements were taken from 3 different areas: subscapula, triceps, biceps, abdominal.

Vertical jump measurement: An electronic smart speed lite system was used to measure the vertical jump performances of athletes. Vertical jump test was applied after approximately 15 minutes of active warm-up, 5 minutes of jogging, 5 minutes of short quick climbs, and 5 minutes of stretching movements. When athletes feel ready they jumped as high as they could, then landed on the mat. Jump distances of athletes were measured electronically in centimeters; they were given 3 attempts and the best value was recorded.

Hip circumference measurement: Measurements were made with a non-elastic tape measure with an accuracy of 0,001 m. Circumference was measured at the level of the symphysis pubis at the front and at the level of the most protruding point of the hip muscles at the back.

Waist circumference measurement: Measurements were made with a non-elastic tape measure with an accuracy of 0,001 m. Circumference of the narrowest part of the abdomen was measured when athletes were standing tall, with the abdomen relaxed, arms hanging freely from the sides, with legs closed.

Claw, Leg and back strength measurement: Claw strength was measured with a Takkei brand hand

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dynamometer (Hand Grip), and back and leg strength was measured with a back and lift dynamometer. Strength values of the subjects were recorded in kilograms.

2.2. Statistical Analysis

Data was encoded by entering to SPSS package software, Pearson Correlation Analysis was used to determine the relationship between strength parameters of anthropometric measurements and vertical jump performance, and p<0,05 values were considered significant.

3. FINDINGS

In this section, the relationship between certain anthropometric measurements and strength parameters and vertical jump was examined on national team wrestlers who voluntarily participated in our study.

Table 1. Average and standard deviation values of physical variables of wrestlers

	n	Min	Max	Avg	*S.D*
AGE(yrs)	**16**	20,00	29,00	23,62	2,44
HEIGHT(cm)		168,00	188,00	177,31	5,18
WEIGHT(kg)		67,30	120,00	86,45	14,91
BKI(kg/m^2)		22,20	34,20	27,20	3,72

Table 2. Average and standard deviation values of strength variables of wrestlers

	n	Min	Max	Avg	*S.D*
LEGSTR(kg)	**16**	130,50	190,20	155,13	14,02
BACKSTR(kg)		135,00	210,50	162,54	20,32
CLAWSTRRIGHT(kg)		46,40	75,20	58,81	8,52
CLAWSTRLEFT(kg)		41,40	82,70	56,96	10,40

Table 3. Relationship between certain strength variables and anthropometric measurements of wrestlers

		Skinfold Subscapula	Skinfold Triceps	Skinfold Biceps	Skinfold Abdominal	Waist circ.	Hip circ.
BACKSTR(kg)	r	**,578***	,370	,179	,485	**,547***	,460
	p	**0,01**	0,15	0,50	0,05	**0,02**	0,07
LEGSTR(kg)	r	**,773****	**,572***	,483	**,666****	**,708****	,302
	p	**0,00**	**0,02**	0,05	**0,00**	**0,00**	0,25
CLAW STRENGTH RIGHT ARM (kg)	r	**,661****	,413	,415	,447	,432	,312
	p	**0,00**	0,11	0,11	0,08	0,09	0,24
CLAW STRENGTH LEFT ARM (kg)	r	**,553***	,437	,299	**,540***	**,568***	,276
	p	**0,02**	0,09	0,26	**0,03**	**0,02**	0,30

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	N	**16**	**16**	**16**	**16**	**16**	**16**

When Table 3 is examined, a positively significant relation is observed between back strength and subscapula (r: 0,578*, p < 0,05). There is also a significant positive relationship between back strength and waist circumference (r: 0,547*, p < 0,05). While there is a positive and highly significant relationship between leg strength and subscapula (r: 0,773**, p < 0,01) , abdominal (r: 0,666**, p < 0,01), waist circumference (r: 0,708**, p < 0,01), another positive significant relationship was observed with triceps (r: 0,572*, p < 0,05). There is a highly significant positive correlation between the right claw strength parameter and subscapula (r: 0,661**, p < 0,01). There was a positive and significant relationship between left claw strength parameter and subscapula (r: 0,553*, p < 0,05), abdominal (r: 0,540*, p < 0,05) and waist circumference (r: 0,568*, p < 0,05).

Table 4. Relationship between Vertical Jump and Anthropometric measurements

		n	Skinfold Scapula	Skinfold Triceps	Skinfold Biceps	Skinfold Abdominal	Waist Circumference	Hip Circumference
Vertical Jump	r	16	-,285	-,071	,126	-,110	-,404	-,440
	p		,285	,793	,642	,684	,121	,088

When Table 4 is examined, no relationship was found between vertical jump and anthropometric measurements.

Table 5. Relationship between Vertical Jump and Strength parameters

		n	Leg Strength	Back Strength	Claw Strength Right	Claw Strength Left
Vertical Jump	r	16	-,244	-,264	-,078	-,153
	p		,362	,323	,775	,573

When Table 5 is examined, no relationship was found between vertical jump and strength parameters.

4. DISCUSSION AND CONCLUSION

When the physical characteristics of the athletes participating in the study are evaluated, it can be said that they are similar to the physical characteristics of elite wrestlers reported in certain studies in the literature. (Callaway et al. 1988, Freischlag 1984, Yoon 2002). According to the results of the research (table 2), the Average Back and Leg Strength of the athletes participating in the study are as follows; Back Strength 162,54 kg and Leg strength 155,13 kg. Şenel et al., in their study conducted in 2009 on 31 wrestlers with an average age of 21, found the average back strength as 163,71 kg and leg strength as 136,86 kg which is similar to our findings. In a study they conducted in 1992, Hazar et al. (1992) found leg strength in wrestlers as 181,71 kg. Akkuş and İnal (1999) found the leg strength as 183,59 kg in leg strength test they conducted on Selçuk University wrestling team. The reason for the uncertainty in these studies may be individual differences (age, height, kg) and it is thought to be due to the small

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number of athletes participating in the study.

When Claw Strength was examined (Table 2), it was found that right claw strength was 58,81 kg whereas left claw strength was 56,96 kg. When we look at the studies in the literature; Ziyagil in his study in 1991 found the right claw strength of 32 freestyle wrestlers as 48,7 kg and left claw strength as 47,2 kg. There are variations between this study and our findings, which is thought to be due to individual differences such as age, height, and weight. In the study performed by Song and Cipriano in 2007, 11 wrestlers were measured twice at intervals, and following averages were obtained; right claw strength as 51,1 kg and left claw strength as 49,1 kg in the first measurement, right as 52,2 kg and left as 49,9 kg in the second one. Aydos et al. (2009) found that Claw strength (dominant) was 51,21 in their study conducted on 66 athletes. Studies conducted support our findings. When we look at the parameters of back, leg and claw strengths of wrestlers in our study, it can be said that the results we obtained are similar to the results of other studies in the literature.

A significant positive correlation was found between claw strength and anthropometric measurements (Table 3). Aydos et al. found a positive and significant relationship between dependent variables such as height, body weight, BMI, chest width, chest depth, neck circumference, waist circumference, bi-acromial diameter, length and width and independent variables such as back strength, leg strength and claw strength of wrestlers as a result of their research conducted in 2009. This result supports our study. According to the results of the study, there is also a positive significant relationship observed between the back strength and the subscapula and waist circumference of the wrestlers participating in the study (Table 3), Aydos et al. found a positive significant relationship between back strength and waist circumference in their study conducted in 2009 and this supports our study. There is a highly significant positive correlation between leg strength parameter and subscapula, abdominal waist circumference (Table 3). Aydos et al. found a positive and significant relationship between leg strength and waist circumference in their study conducted in 2009 and this supports our study.

There was no correlation between vertical jump and anthropometric measurements (table 4), Crawford reported in a 1996 study that there was the same directional correlation between height and vertical jump and anaerobic strength. Again, there no relationship was observed between vertical jump and strength parameters (table 5). Günay et al. reported in their study in 1994 that body weight has the same directional correlation with strength, vertical jump, flexibility and anaerobic strength. The reason for the difference between these results and our findings may be individual differences (age, height, weight) and it is thought to be due to small number of athletes participating in our study.

As a result, the relationship between anthropometric characteristics and physical performance of elite wrestlers was examined, and a high correlation was found between anthropometric features and strength performances. In addition, it is a remarkable detail that no significant difference could be detected between the leg, back, right and left claw strengths of wrestlers and their anthropometric characteristics.

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5. SUGGESTIONS

Considering this study and similar studies;

- The effect of anthropometric measurements of wrestlers on some force parameters can be determined and they can improve their performance by working in this area.
- In order to determine the impact of anthropometric measurements on performance in the developing sports world, Contribution to sports sciences can be made by doing different performance studies.

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Ethical text
"In this article, the journal writing rules, publication principles, research and publication ethics, and journal ethical rules were followed. The responsibility belongs to the author (s) for any violations that may arise regarding the article. "

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