

The Effects of Specialized Grip Strength Training on Hand-Grip Performance of Male Wrestlers Aged 13-17

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Abstract

The purpose of this research was to examine the effect of special grip strength-improving training on the performance of male wrestlers aged 13 – 17 years. The research sample consisted of 40 athletes the Wrestling Training Center in the district of Kavak in the province of Samsun, Türkiye. In addition to the annual training plan, the athletes in the experimental group underwent a special grip strength improving application consisting of five separate measures on a regular basis for eight weeks. The control group continued with their activities in line with the Wrestling Training Center annual training plan. Differences in grip strength in the groups were determined using Student's t test, while relationships between participants' ages, years spent in sport, height, weight, and grip strength (improvement values) were determined using Pearson's correlation coefficient. SPSS version 22.0 software was used for all statistical calculations. The eight-week special grip strength training produced a statistically significant improvement (difference measurements) in the athletes' right (P<0.001) and left hands (P=0.004). The special grip strength-improving training measures applied for eight weeks improved grip strength, an important ability for success in the sport of wrestling.

Keywords: Grip strength, Wrestling, Special Training

13-17 Yaş Arası Erkek Güreşçilerde Özelleştirilmiş Kavrama Kuvveti Antrenmanının El Pençe Performansına Etkisi

Öz

Bu araştırmanın amacı, pençe kuvveti geliştirici özel antrenman uygulamalarının 13 – 17 yaş aralığındaki erkek güreşçilerin performansları üzerine etkisinin incelenmesidir. Araştırmanın örneklemini Samsun İli Kavak İlçesinde bulunan Güreş Eğitim Merkezinde eğitim gören 40 sporcu oluşturmaktadır. Deney grubundaki sporculara yıllık antrenman planına ek olarak beş ayrı çalışmadan oluşan pençe kuvvetini geliştiren özel antrenman uygulaması düzenli olarak sekiz hafta boyunca uygulanmıştır. Kontrol grubu Güreş Eğitim Merkezi yıllık antrenman planına uygun olarak çalışmalarına devam etmişlerdir. Pençe Kuvvetindeki değişimin gruplara göre farklılığı Student T Test; katılımcıların yaşı, sporcu yaşı, boy, kilo ile pençe kuvveti fark değerlerinin (gelişim değerlerinin) arasındaki ilişki Pearson korelasyon katsayısı ile belirlenmiştir. Tüm

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istatistiksel hesaplamalarda SPSS 22.0 V. istatistik paket programı kullanılmıştır. Elde edilen veriler incelendiğinde, 8 haftalık özel pençe kuvveti geliştirici antrenman uygulamasının sporculardaki hem sağ el ($P<0,001$) hem de sol el ($P=0,004$) pençe kuvvetlerindeki gelişim düzeyleri (fark ölçümler) arasında istatistiki olarak anlamlı bir farklılık belirlenmiştir. Sekiz hafta uygulanan pençe kuvveti özel antrenman uygulamalarının güreş sporunda başarı için önemli bir kabiliyet olan kavrama kuvvetini geliştirdiği tespit edilmiştir.

Anahtar Kelimeler: Pençe Kuvveti, Güreş, Özel Antrenman.

INTRODUCTION

The effects on humans of the concepts of sport, training, and physical exercise are increasing on a daily basis and are having a positive impact on societal development. Sporting activities have been identified as an important component of development as an international economic and social phenomenon (Saatcioğlu and Karaca, 2012). Sport is also a biological, pedagogic, and social activity that develops physical activity, motoric skills, and mental, psychological, and social behaviors and that encourages competition based on these characteristics within specific sets of rules (İnal, 2013).

Wrestling is one of the most important traditional sports in Turkish society and has occupied an important place in the culture of the Turkish people that dates back thousands of years (Şahin, 2006). It has always been one of the branches of sport that has attracted the greatest interest among the Turkish nation (Türkmen and Canuzakov, 2019). As in all other branches of sport, wrestling is much enjoyed by the public, is of considerable assistance in strengthening the national consciousness, and brings people together with a shared sense of excitement and equality across a wide range of emotions (Türkmen, 2011). In addition, wrestling is an Olympic sport enjoyed in numerous countries of the world (Türkmen and Atan, 2011). It also represents the branch of sport that wins the largest number of medals for Turkey during international competitions, and particularly the summer Olympic Games. Sports scientists and wrestling trainers in Turkey therefore make very great efforts to be able to reach the highest level in this sport and to confirm their place there. This shows the importance of the performances of athletes who devote themselves to wrestling in Turkey.

Wrestling is a multifaceted sport that, under current rules, involves the expenditure of anaerobic energy for two rounds of three minutes' duration each, that requires high levels of strength, flexibility, and agility for sudden attacks during bouts, and that also involves psychological and emotional preparation (Bloomfield et al., 1994; Yoon, 2002; Grindstaff and Potach, 2006). In technical terms, wrestling involves a contest in which two individuals seek to defeat their opponent using all their strength and ability within a specified time frame and specific rules, with no tools or materials being employed, by exhibiting technical superiority through achieving a higher score than one's opponent (Acak et al., 1997).

A very close relationship exists between the sport of wrestling, in which explosive strength and continuity of strength are essential, and physical competence values such as dynamic isometric strength, continuity of strength, and maximal strength (Alper and Eroğlu Kolayış, 2020). Strength training takes an important place for wrestlers and it is great importance especially in the preparation period of annual training plans. In order to create training programs, pre-tests must be applied and programming should be guided through these findings (Kılınç et al., 2011).

Purpose

The purpose of this research was to investigate the potential effect of grip-enhancing training on grip strength in young wrestlers aged 13-17 years.

METHOD

The requisite ethical committee approval was obtained before the study procedures commenced. An eight-week grip strength training program was subsequently applied to

wrestlers in the 13-17 age group, after which measurements were performed for data collection. The data were collected and recorded by the researchers using a Personal Information Form and grip strength measurements. These grip strength measurements were carried out before and at the end of the eight-week training program.

Population and Sample

The research population consisted of male wrestlers aged 13-17. The sample was made up of 40 randomly selected individuals training in the wrestling training center in the district of Kavak in the Turkish province of Samsun. Female wrestlers were not included

in the study. The reason is that we cannot find enough female athletes.

The wrestlers were randomly divided into two groups with 20 athletes in each group. Twenty of the wrestlers taking part in the research were enrolled as the control group, and these underwent only normal training. In addition to normal training, the remaining 20 wrestlers also received special grip strength training consisting of five stations, five sets, and 15 repetitions in 24 sessions for eight weeks. No other procedure was applied to the athletes.

Table 1: The Special Grip Strength Program

	Monday	Wednesday	Friday
WEEK	Crush Grip (4*15)	Crush Grip (4*15)	Crush Grip (4*15)
	Pinch Grip (4*30 sec)	Pinch Grip (4*30 sec)	Pinch Grip (4*30 sec)
	Support Grip (4*30 sec)	Support Grip (4*30 sec)	Support Grip (4*30 sec)
	Wrist Roller (4*15)	Wrist Roller (4*15)	Wrist Roller (4*15)
	Towel Curl (4*15)	Towel Curl (4*15)	Towel Curl (4*15)

The Measurements and Tests used In The Research

The tests and measurements were conducted in the Samsun Kavak Yaşar DOĞU Wrestling Training Center Wrestling Hall. The athletes were informed about the study and the measurements before the tests and activities. The measurements and tests were performed in the order and manner described below.

Weight and Height Measurement

The athletes were weighed in T shirts and shorts using a CAS P8 scale. Measurements were carried out with an accuracy of 0.1 kg. and before eating (Dulger and Bas, 2021)..

Height was measured using a Loco Active MST-B01 device. The wrestlers were measured in bare feet, with their heads erect, the soles of their feet flat on the ground, the heels together, and their bodies tensed (Bas et al., 2006).

All measurements were performed before and at the end of the eight-week training program.

Grip Strength Test

Hand grip strength was measured using a TAKEI A5401 model (Japan) digital dynamometer. During the measurements, the athletes were asked to look toward the opposite side, with their feet shoulder-width apart and in the standing anatomical position, and with the elbow in full extension. Prior to hand grip strength measurement, the dynamometer was adjusted to the size of the athlete's hand. The athlete was asked to hold the dynamometer in a 90-degree flexion position on the index finger, with the hand relaxed. The wrestlers were then asked to squeeze the device with all their strength for three seconds, to hold their breath during the measurement, and to avoid shaking the device. In order to determine their dominant hands, the participants were asked which hand they would use to throw a ball or for writing. The athlete's dominant hand grip strength was measured three times, the highest value achieved being recorded in kilograms (kg) for statistical analysis. A rest period of at least one minute was allowed to elapse between

each test (Kim et al., 2018; Nefesoglu and Bas, 2021). The same method was applied for the non-dominant hand.

Statistical Analysis

The Shapiro-Wilk test was applied to determine whether the hand grips strengths of the individuals participating in the study on a voluntary basis were normally distributed according to the groups (study and control) ($P>0.05$). Whether the change in repeat hand grip measurements (final measurement-initial measurement value difference) was normally distributed according to the groups was examined using Student's t test. Additionally, relationships between the participant's ages, years in the sport, height, and weight and

hand grip values (improvement values) were determined using Pearson's correlation coefficient. All statistical analyses were performed on SPSS version 22.0 software. The research findings were expressed as number (n), percentage, mean, and standard deviation. p values <0.05 were regarded as statistically significant.

RESULTS

The distributions of the demographic characteristics of wrestlers aged 13-17 training at the wrestling training center in the Kavak district of Samsun in 2021-2022 are shown in tables 2 and 3.

Table 2: Percentage Distributions For The Wrestlers' Demographic Characteristics

Group	n	%				
Experimental	20	50.0				
Control	20	50.0				
Total	40	100.0				
Age (years)	n	%	Years in the sport	n	%	
13	15	37.5	4	10	25.0	
14	6	15.0	5	7	17.5	
15	7	17.5	6	8	20.0	
16	8	20.0	7	2	5.0	
17	4	10.0	8	13	32.5	
Total	40	100.0	Total	40	100.0	
Mean age 14.5 years SD±1.43		Mean length of time in the sport 6.03 years SD± 1.61				

Distributions of mean ages and years spent in the sport within the groups are shown in Table 2.

Table 3: Wrestlers' Height And Weight Distributions According To Demographic Characteristics

Groups	Experimental		Control	
	Mean	Standard Deviation	Mean	Standard Deviation
Height (cm)	165.55	6.48	168.00	10.32
Weight (kg)	62.20	11.19	65.75	17.53

The mean height of the members of the experimental group voluntarily participating in the study was 165.55 cm, and their mean

A statistically significant difference was observed in improvement (difference measurements) in both right hand ($P<0.001$) and left hand ($P=0.004$) grip strengths

weight was 62.20 kg. The equivalent values in the control group were 168 cm and 65.75 kg (Table 3).

between the experimental and control groups as a result of the eight-week special grip strength-improving training (Table 4).

Table 4: Right And Left Hand Grip Values For The Study Groups (Kg)

Groups	Measurements	First Measurement		Second Measurement		Difference		P-value
		Mean	SD	Mean	SD	Mean	SD	
Experimental	Right hand	34.91	8.96	38.37	7.99	3.46	2.24	<0.001
Control	Right hand	38.88	9.84	39.46	9.82	0.58	1.25	
Experimental	Left hand	34.25	8.53	37.17	7.48	2.92	2.66	0.004
Control	Left hand	37.39	9.45	38.24	9.31	0.85	1.43	

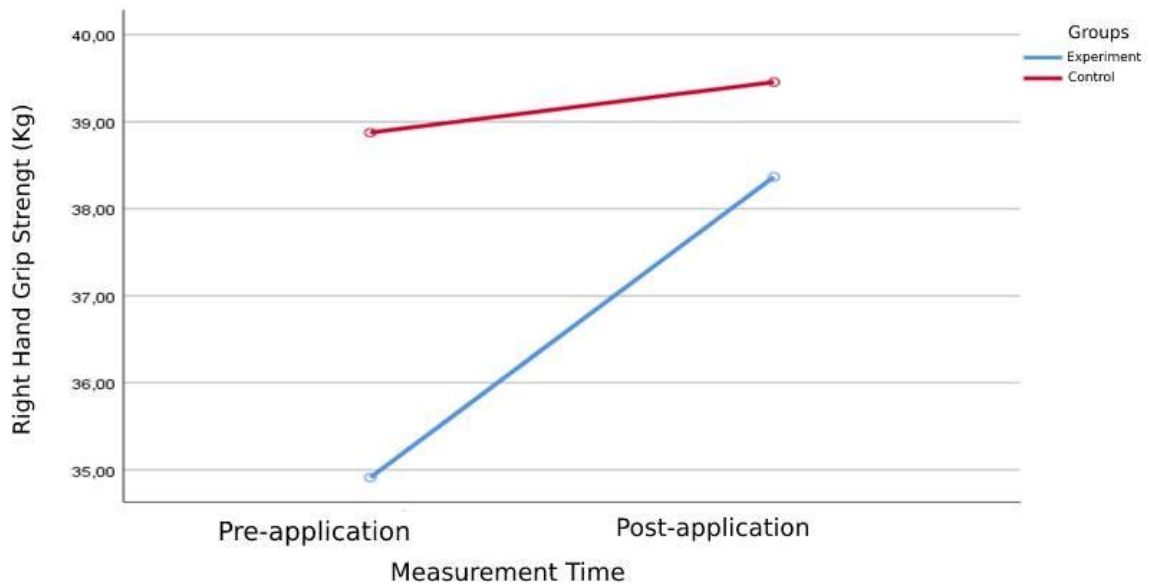


Figure 1: Right Hand Grip Strength Measurements Before And After The Eight-Week Grip Improvement Training

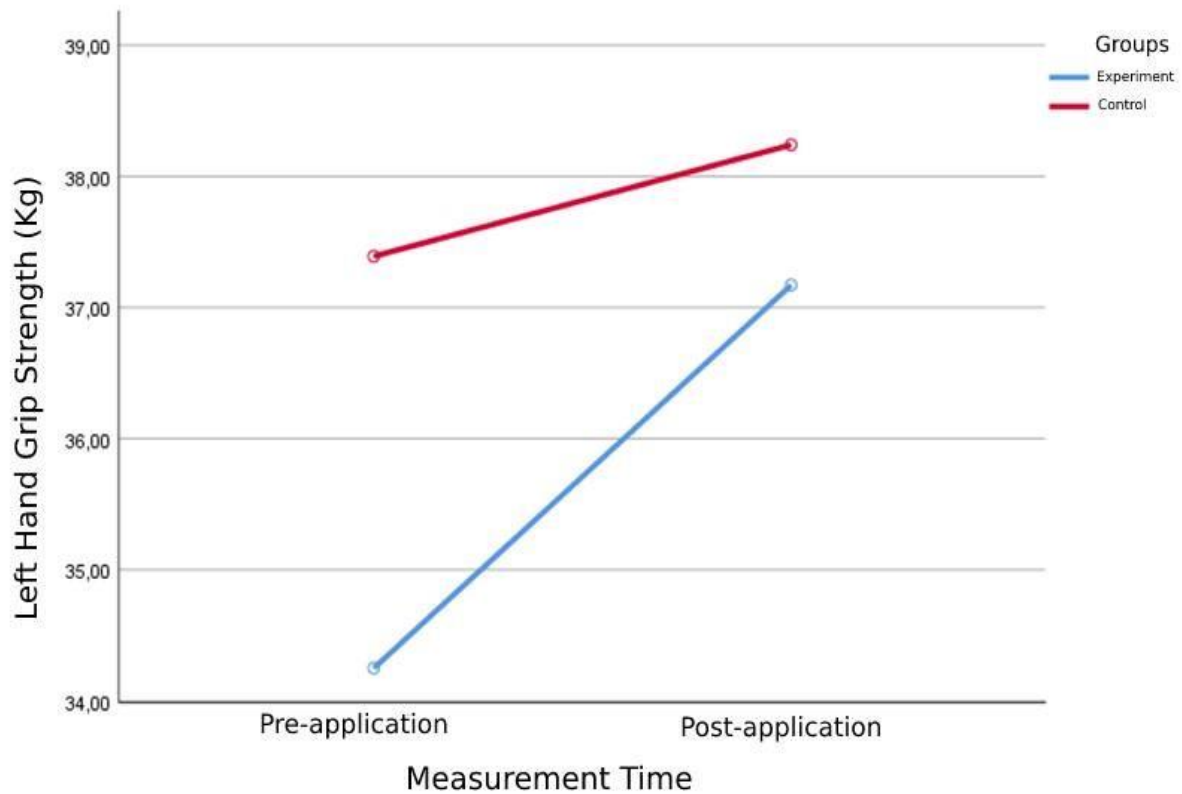


Figure 2: Left Hand Grip Strength Measurements Before And After The Eight-Week Grip Improvement Training

Table 5: Relationships Between Wrestlers' Right-Left Grip Strength Measurements And Age, Years In The Sport, Height, And Weight

Measurements		Years in the sport	Weight	Height	Improvement in right hand grip strength	Improvement in left hand grip strength
Age	r-value	0.856	0.502	0.477	-0.468	-0.460
	p-value	<0.001	0.024	0.034	0.038	0.041
Years in the sport	r-value		0.438	0.443	-0.333	-0.390
	p-value		0.054	0.050	0.151	0.089
Weight	r-value			0.901	-0.129	-0.173
	p-value			<0.001	0.588	0.465
Height	r-value				-0.232	-0.154
	p-value				0.324	0.516
Improvement in right hand grip strength	r-value					0.157
	p-value					0.508

An approximately 46% negative correlation was observed between the wrestlers' age and right and left hand grip strength improvement levels ($P < 0.05$). The rate of increase in grip

strength improvement in association with special grip strength decreased in line with the participants' ages (Table 5). An approximately 33% weak negative correlation was found between the wrestlers' years in

sport and right hand grip strength improvement, and an approximately 39%

weak negative correlation with left hand grip strength improvement ($P>0.05$; Table 5).

DISCUSSION and CONCLUSION

The purpose of this research was to examine the effect on grip strength, which occupies an important place in the performance of techniques in the sport of wrestling, of special grip strength-improving training on athletes aged between 13 and 17 who regularly took part in wrestling. The mean age of the participating wrestlers was 14.5 years, and the mean time elapsed since commencing regular wrestling training was six years.

The first striking point in the results obtained is that the control group's grip strength values in kg were higher than those of the experimental group. This is due to the initial grip strength values among the athletes in the control group being approximately 4 kg better than those in the members of the experimental group since the research design involved random selection.

Mean findings in the control group at the first measurement were 38.88 ± 9.84 kg in the right hand and 37.39 ± 9.45 kg in the left hand, compared to 34.91 ± 8.96 kg in the right hand and 34.25 ± 8.53 kg in the left hand in the experimental group. Mean values at the second measurements performed after eight weeks were 39.46 ± 9.82 kg in the right hand and 38.24 ± 9.31 kg in the left hand in the control group, compared to 38.37 ± 7.99 kg in the right hand and 37.17 ± 7.48 kg in the left hand in the experimental group. The differences (t values) in the experimental group were 3.46 ± 2.248 kg in the right hand and 2.92 ± 2.66 kg in the right hand, compared to 0.58 ± 1.25 kg in the right hand in the control group and 0.85 ± 1.43 kg in the left hand. The grip strength findings in the present study are similar to those reported in some previous research. In Bayraktar et al.'s (2012) study of 415 athletes with a mean age of 15.11 ± 0.69 years and a mean 4.0 ± 1.26 years in sport, the participants' mean right hand grip strength was 37.98 ± 11.13 kg and their mean left hand grip strength was 37.58 ± 10.98 kg. Similarly, another study involving 20

wrestlers with a mean age of 12.9 years who attended eight-week strength training reported a mean first measurement right hand grip strength of 35.15 ± 7.34 kg and a mean left hand value of 35.40 ± 7.32 kg. At the second measurements performed after the training, the right hand value increased to 38.9 ± 7.50 kg and the left hand value to 38.45 ± 6.85 kg (Bağcı, 2016). Another study examining grip strengths between age groups reported mean right and left hand grip strengths of 36.4 ± 10.7 and 34.9 ± 10 kg in wrestlers aged under 15 (Demirkan, 2015).

Based on our study results, the levels of improvement in the athletes' right ($P<0.001$) and left ($P=0.004$) hand grip strengths (difference measurements) differed significantly compared to baseline following the eight-week special hand grip strength-improving training. The changes in grip strength following extra strength training observed in several previous studies are consistent with those in the present research. Aslan et al. (2013) observed the one-year improvement in 26 wrestlers aged between 13 and 15 and reported a statistically significant 19.7 kg improvement ($p<0.001$). Similarly, Aktaş et al. applied eight-week strength training to 20 tennis players aged between 12 and 14 and reported statistically significant ($p<0.01$) improvement in both right and left hand grip strengths (Aktaş et al. 2011). Another study, of handball players aged between 12 and 14, determined a statistically significant $p<0.05$ level improvement in right hand grip strengths following eight-week combined training, and a significant $p<0.001$ improvement in the left hands (Çimen and Kılınc, 2017). Findings consistent with the current research have been obtained in strength studies involving athletes of similar ages to our wrestlers but engaged in different sports. Çelikel et al. applied a weekly strength program involving one hour a day for three days to 10 archers aged 15-17 actively

engaged in the sport. Those authors reported statistically significant differences between the initial right and left hand measurements (35.31±6.789 kg and 34.32±6.814 kg, respectively) and the final measurements (right hand 37.68±6.851 g and left hand 36.55±6.595 kg) (Çelikel et al., 2020). On the other hand, although Cicioğlu et al. detected a numerical change in the hand grip strengths of wrestlers in the 15-17 age group following two-hour training, six days a week for 9.5 months (right hand 14.77% and left hand 15.25% increases) they also reported that this was not statistically significant (Cicioğlu et al., 2007).

No significant difference was observed in the present research in either right or left hand grip strengths in the first and second measurements in the control group. Some previous studies have also reported that grip strength increased numerically in controls groups that adhered regularly to annual training plans, but that this was also not statistically significant (Bağcı, 2016; Çimen and Kılınç, 2017; Çelikel et al. 2020)

Another aim of this study was to determine whether a relationship exists between age and grip strength improvement. The results obtained indicated a statistically significant relationship at the $p<0.05$ level between age and grip strength improvement. Moderate correlations were determined between age and right hand grip strength improvement ($r=-0.468$) and between age and left hand grip strength improvements ($r=-0.460$). Similarly, a previous study investigating grip strengths between age groups reported right and left hand grip strength values of 36.4±10.7 kg and 34.9±10 kg, respectively, in 15-year-old wrestlers. Those authors also reported higher grip strength values with age (Çelikel et al., 2020).

No significant relationship was found in the present study between years in the sport and right or left hand grip strengths following the eight-week grip strength-improving training. No statistically significant relationships were also observed between the other variables of height and weight and right or left hand grip strengths.

A statistically significant In conclusion, based on the study findings, differences (t values) of 3.46±2.248 kg in the right hand and 2.92±2.66 kg in the left hand in the experimental group were determined following the eight-week special training program, compared to 0.58±1.25 in the right hand and 0.85±1.43 kg in the control group. According to our own results and those of previous studies designed using extra or special training for specific periods, eight-week special training improved hand grip strength more than the normal training period.

Authors' Statement of Contribution to the Article

Idea/Concept: Orhan Baş, İlker Aydın; Article design: Orhan Baş, İlker Aydın; Consulting: Orhan Baş; Data Collection and Processing: İlker Aydın; Analysis/Comment: Orhan Baş, İlker Aydın; Literature review: Orhan Baş, İlker Aydın; Article writing: Orhan Baş, İlker Aydın; Critical Analysis: Orhan Baş, İlker Aydın; Source/Material: Orhan Baş, İlker Aydın; Article Submission Corresponding Author: Orhan Baş.

Conflict of Interest

The authors have no conflict of interest to declare.

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Ethics Committee Approval

This study is in line with the Declaration of Helsinki. Ethics Committee. Approval report was obtained for the study with the decision of Ordu University Clinical Research Ethics Committee dated 03.06.2021 and numbered 141.

Peer Review

After the blind review process, it was found suitable for publication and accepted.

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