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INVESTIGATION OF THE EFFECT OF EIGHT-WEEK FUNCTIONAL STRENGTH TRAINING ON BODY FAT PERCENTAGE AND ANAEROBIC POWER CAPACITY OF MALE WRESTLERS

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ABSTRACT

This study aims to examine the effect of functional strength training on body fat percentage and anaerobic power values in male wrestlers. The research was applied to 33 male wrestlers competing in the Turkish Wrestling 1st League. In the Experimental (Functional Strength Training) group, the mean age of wrestlers (n=17) was 20.4 ± 1.37 years, and their height values were 176.4 ± 6.84 cm. In contrast, in the Control group, the mean age of wrestlers (n=16) was 20.6 ± 1.05 years, and their height values were 173.4 ± 7.2 cm. Volunteer participants in the experimental groups applied functional strength training models 3 days a week (Monday, Wednesday, Friday) for 8 weeks during the pre-season preparation period. In addition, the control and experimental groups (Tuesday, Thursday, Saturday) took part in the routine wrestling training. A measurement circuit was set up, and after recording body weight, height, and age sequentially, subcutaneous fat measurement, 6-second and 30-second watt-bike anaerobic power, handgrip, and back isometric strength values were recorded in the data form. The measurements recorded in the data form were arranged in the MS Excel spreadsheet program. Two-way ANOVA for repeated measures was used to determine the differences between the first and last measurement values of the participants. Effect values have been determined. As findings, when the results obtained at the end of the eight-week training period are evaluated, in-group X time interaction dimension; A significant change was observed in body weight (kg), body fat percentage (%), 6-sec peak power (watt) and power mass (watt/kg), as well as right and left-hand claw strength (kg) ($p<0.05$). In addition, it was determined that there was a small effect in the values that showed a significant change In conclusion, the functional strength training group exhibited improvements in several performance parameters, including reductions in body weight and body fat percentage, as well as an increase in right-hand grip strength, following an 8-week training period. Structuring functional strength training practices as a supportive training model is thought to be more effective.

Keywords: Strength, Functional, Wrestling.

INTRODUCTION

Wrestling stands out as one of the oldest sports disciplines in the history of sports. Wrestling has manifested itself across a spectrum that stretches from Mesopotamia, Ancient Egypt, and Greece to Central Asia and became a significant element in the cultural influences of our societies (Özdemir and Çalışkan, 2018). The sport of wrestling consists of dynamic and explosive movements in both technique and game discipline. In addition, the fact that it is divided into short sections increases the extension of the sport of wrestling (Karnincic et al., 2009). During the wrestling match, most of the game takes place in the area where the anaerobic energy system is predominantly used (Mirzaei et al., 2017). However, the fact that wrestling is played in 3-minute circuits and has only half a minute for recovery requires an advanced aerobic system for recovery in wrestling sports (Callan, 2000).

Anaerobic strength is a very important factor for success in sports branches that usually involve short-term and explosive exercises. It has been shown that the amount of blood lactate in a wrestling match can reach up to 20 mmol/L (Karnincic et al., 2009). Anaerobic power levels are used extensively in contact and physical combat in wrestlers (Caloglu & Yüksel, 2020). Wrestlers generally need to respond to complex physical demands to succeed in wrestling, and almost all biomotor skills must be developed in wrestling (Yoon, 2002). Generally, it has been seen that successful wrestlers have high anaerobic power and capacity, as well as muscle strength, flexibility, and lean mesomorph body structure (Nikooie et al., 2015).

The ability to generate power in wrestling becomes more effective as athletes move from the lightweight to the heavyweight categories (Starosta et al., 2010; Baić, Starosta, and Damir, 2021).

In wrestling, body fat percentage is also an important parameter. This is because wrestling is a weight-class sport, similar to boxing, judo, and weightlifting (Steen and Brownell, 1990). In the wrestling discipline, achieving the targeted weight class is of great importance. Competing below or above one's weight category can significantly affect the individual performance of the athlete (Akhoundnia et al., 2019). Similarly, the performance interaction related to the level of body fat percentage is not clearly understood.

In wrestling, the hand plays a functionally important role in certain movements where it is the sole point of physical contact with the opponent, contributing to overall performance (Young, 2003). In sports disciplines like wrestling that involve close contact, all moves begin with fundamental actions such as catching and gripping the opponent (Iermakov, 2016). The grip strength provides an advantage in defending against the opponent's attacks and gaining control during moves. Additionally, since the wrestling outcomes are significantly influenced by it, strength testing generally forms part of the evaluation process for wrestlers at all levels (Baechle and Earle, 2008). The degree of handgrip strength indicates the level of strength capability (Podrihalo et al., 2020). One of the primary functions of the back muscles is related to maintaining proper posture (Stankovic et al., 2012). The strength of the back muscles is an effective parameter in successful wrestlers (Mirzaei et al., 2011).

Functional training was initially used for rehabilitation purposes (Cress et al., 1996). Nowadays, it is employed to enhance athletic performance because it allows athletes to be trained closely to the movements experienced in sports competitions. The versatility of functional training is a significant reason why coaches and athletes widely prefer it for overall development. The multi-joint and multi-plane nature of functional training suggests that it could be an effective method for contact-dependent sports such as wrestling (Silva-Grigoletto et al., 2014).

Functional strength training is an exercise method that involves the demonstration of dynamic functional activity during movements (Liu et al., 2017). Compared to traditional, static weight training using equipment, weight training that incorporates multi-joint movements is said to be more effective in eliciting greater muscle strength and increasing fitness levels (Castro et al., 2020).

In this study, the impact of functional strength training on changes in body fat and performance parameters has been examined.

METHOD

Model of the Research

The research utilized an experimental method. Both experimental and control groups were included, and pre-test and post-test models were employed (Karasar, 2023).

Study Group

The study included 33 male wrestlers who actively competed in the Turkey Wrestling 1st League and had a healthy status for the past 5 years. They participated as voluntary participants in the study. In the Experimental (Functional Strength Training) group, the mean age of wrestlers (n=17) was 20.4 ± 1.37 years, and their height values were 176.4 ± 6.84 cm. In the Control group, which consisted of wrestlers (n=16), the mean age was 20.6 ± 1.05 years, and their height values were 173.4 ± 7.2 cm.

Data Collection

The participants in the experimental group underwent a functional strength training program three days a week (on Mondays, Wednesdays, and Fridays) for eight weeks during the pre-season preparation period. In addition, control and experimental groups participated in routine wrestling training (Tuesday, Thursday, and Saturday). After recording body weight, height, and age, subcutaneous fat measurements, 6 and 30-second Wattbike anaerobic power, hand coverage, and back isometric force values are recorded in data forms. Written and verbal explanations were given to the individuals participating in the study about the study and the measurements to be made. Those who agreed to participate in the study were asked to fill out a voluntary consent form. Before the test, each participant went through a gradual, standardized warm-up period of 15 minutes on the field. All tests were performed on the same day and supervised and recorded by the same researcher. As of the meeting date on 11/30/2021, the Dumlupınar University Scientific Research and Publication Ethics Committee has approved the ethical compliance and feasibility of the study under meeting number 2021/09. Participants were prohibited from using alcohol, stimulant drugs, caffeine, and similar substances at least 48 hours before the performance tests. The assignment of participants to the Experimental and Control groups was determined in a randomized manner. Throughout the eight-week period, participants continued with their regular dietary habits under the supervision of a nutrition specialist.

Sample selection criteria:

• The chronological age of participants should be at least 18 and at most 24 years old.
• During the training period, participants should have a strong willingness to participate regularly in training sessions.
• Participants should be actively competing in the Turkey Wrestling 1st League and maintaining an active sports career for the past five years.
• Participants should have an informed consent form containing the statement "there is no health-related impediment to their participation in the study," which is issued by a qualified physician.

Height and Body Weight

Participants' height measurements were recorded using a Holstein brand sliding caliper with a precision of 1 mm. The sliding caliper was used with participants standing in an upright position and ensuring that the top of their heads was touched. Weight measurements were taken using a scale with a precision of 0.01 kg (Angel brand). Participants stood on the scale with their weight evenly distributed on both feet and recorded in kilograms (kg) while in an upright position (Tamer, 2000).

Skinfold Measurements

The participants were taken using a Holstein brand skinfold caliper, following the anthropometric measurement protocol, from the M. triceps brachii, M. biceps brachii, M. subscapularis, M. pectoralis, M. quadriceps femoris muscles, as well as the supra iliac and abdomen regions (Özer, 1993; Zorba and Ziyagil, 1995). The "Lange" formula was used to determine the body fat percentage (Açıkada et al., 1991). The Lange Body Fat Percentage formula is calculated as follows:

Lange Body Fat Percentage = (Biceps + Triceps + Subscapula + Pectoral + Suprailiac + Quadriceps) x 0.097 + 3.64.

6 and 30 Seconds Anaerobic Power

After providing the participants with preliminary information about the test, they were asked to perform a 5-minute warm-up protocol with a workload of 60-70 W and a pedal speed of 60-70 revolutions per minute (rpm) before starting the test. After warming up, participants were given five minutes to rest. After the warm-up, the seat and handlebars were adjusted for each participant, and their feet were attached to the pedals. The aerodynamic resistance device (resistance equal to 0.75 body weight) and magnetic resistance were adjusted for each participant's body weight measured before the start of the first test. Wattbike anaerobik güç bisikletinden gelen görsel uyaran ekranda görüntülendikten sonra, katılımcılardan testi 5 saniye içinde başlatmaları istendi. The voluntary participants pedaled at maximum speed against the external resistance for 30 seconds. During the test, the participants were verbally motivated to perform at their best. During the test, the results of power parameters were evaluated using the Wattbike Peak Power 30-second software program, and numerical data were obtained. After obtaining the values from the 30-second anaerobic power test, a 6-second peak power anaerobic test was conducted 48 hours later. The same protocol as described above was followed, but this time the participants pedaled the Wattbike Pro at maximum performance for 6 seconds. The results of the power parameters during the test were transferred to the Wattbike Power Peak 6-second software and converted into numerical data (Herbert et al., 2015; Sculthorpe et al., 2017).

Maximal Hand Grip and Back Strength Test

The handgrip strength of each subject was measured using the Takei Grip-D (Japan) brand hand dynamometer. The dynamometer was adjusted according to the hand size of each participant. Participants' arms were positioned at 0 degrees from the shoulder and 90 degrees flexion from the elbow, and they squeezed the dynamometer with their forearms in a neutral position using maximum force. Three measurements were taken separately for the right and left hand. The maximal back strength was measured using a back strength dynamometer (Takei, model T.K.K.5402, Tokyo, Japan). The length of the chain attached to the handles of the back dynamometer was adjusted to fit each participant with their knees at a 45-degree angle. The best value in kilograms (kg) was recorded for each participant (Kraemer et al., 2001).

Statistical Analysis

The data were organized and graphs were created using MS Excel (2019;16.0) in the Windows operating system. The write-up was done using MS Word (Office 365; Version 16) program for Windows. Statistical analysis was conducted using SPSS (24.0) program for Windows. Due to the experimental nature of the study and the mixed design, the ANOVA test was used for statistical analysis (Tabachnick and Fidell, 2007). The assumption of normal distribution was checked by examining the skewness and kurtosis values and using histograms. Skewness and kurtosis values within the range of -1.5 to +1.5 were expected (Tabachnick and Fidell, 2013). According to the obtained findings, both the skewness and kurtosis values, as well as the histograms, indicated that normal distribution was achieved. Additionally, the homogeneity of the dataset was assessed using Levene's test, and the results indicated that homogeneity was established. For examining the effect sizes of the pre-test and post-test within the sample group, Cohen's d formulation was preferred (Cohen, 1992). According to Cohen's d formulation, effect sizes were classified as follows: d = 0.20 (small effect), d = 0.50 (medium effect), and d = 0.80 (large effect).

Training Protocol

During the eight-week pre-season preparation period, the functional strength training mode runs 3 days a week (Monday, Wednesday, Friday) during the experiments. In addition, the participants in the control and experimental groups were given wrestling training including mixed wrestling techniques and tactics for eight weeks, 3 days a week (Tuesday-Thursday-Saturday), provided that the scope and severity were parallel to each other.

Table.1 Functional Strength Training Program

FUNCTIONAL STRENGTH TRAINING PROGRAM						
WEEKS	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1. and 2.	A-Functional Strength Training	Wrestling Technical and Tactical Training	A- Functional Strength Training	Wrestling Technical and Tactical Training	A- Functional Strength Training	Wrestling Technical and Tactical Training
3. and 4.	B- Functional Strength Training	Wrestling Technical and Tactical Training	B- Functional Strength Training	Wrestling Technical and Tactical Training	B- Functional Strength Training	Wrestling Technical and Tactical Training
5. and 6.	C- Functional Strength Training	Wrestling Technical and Tactical Training	C- Functional Strength Training	Wrestling Technical and Tactical Training	C- Functional Strenght Training	Wrestling Technical and Tactical Training
7. and 8.	D- Functional Strenght Training	Wrestling Technical and Tactical Training	D- Functional Strength Training	Wrestling Technical and Tactical Training	D- Functional Strength Training	Wrestling Technical and Tactical Training

A- Functional Strength Training (1st and 2nd week): The training program consisting of 10 stations was applied circularly by the participants. After the determined station was applied for 30 seconds, they were asked to switch to the other station. A 15-second rest was applied between each station. When the 10 station ends, 2-3 minutes. Active rest was applied between The protocol was terminated when they completed 5 sets of 10 stations in a unit of training (Lee et al., 2021). Participants did the movement form specified at all stations. 10 movement patterns; 1. Body weight Bulgarian split squat, 2. Inverted Rows, 3. Hyperextension, 4. Burpee, 5.Rope swinging (each rope weighs 12 kg), 6.Crunch, 7. Tire flips (28 kg), 8. Dynamic plank, 9. Pistol squat, 10. body weight push-ups.

B- Functional Strenght Training (3rd and 4th week): The training program consisting of 10 stations was applied circularly by the participants. After the determined station was applied for 40 seconds, they were asked to switch to the other station. A 20-second rest was given between each station. When the 10 station ends, 2-3 minutes. Active rest was applied between The protocol was terminated when they completed 5 sets of 10 stations in a unit of training (Kaikkonen et al., 2000). Participants did the movement form specified at all stations. 10 movement patterns; 1.Dumbbell arabesque (10 kg), 2.Banded overhead squat (*), 3. Ab Roller crunch, 4. Banded bird dog (*), 5.Banded torso rotation (*), 6. Dumbbell Turkish get-up (12 kg), 7. Skipping rope, 8.Overhead squat with band, 9. Hyperextension, 10. Dumbbell Bulgarian split squat (12 kg).

* Participants were informed about their perceived difficulty levels on the OMNI-RES scale. Scores on the OMNI-RES scale range from 0 to 10, from very mild to very difficult. The OMNI-RES scale was introduced in the movement pattern applied with resistance bands and the perceived difficulty level (AZD) of the participants was determined by looking at the scale and applied. The participants were asked to determine and make the resistance band color appropriate for the intensity of the load according to the OMNI-RES scale, corresponding to the weekly changes in the exercise load (Robertson et al., 2003).

C- Functional Strength Training (5th and 6th weeks): The training program consisting of 10 stations was applied circularly by the participants. After the determined station was applied for 45 seconds, they were asked to switch to the other station. A 20-second rest was applied between each station. A total of 6 sets were applied. 1-2 minutes rest between sets. Participants did the movement form specified at all stations. 10 movement patterns; 1. Tire & sledgehammer (10 kg), 2.Crunch, 3. Burpees Box jumps over, 4.Hyper extension, 5. Ring dips, 6.Ab Roller crunch, 7.Rope swinging (each rope weighs 12 kg), 8 . Air squat, 9. Dynamic plank, 10. Inverted Rows.

D- Functional Strength Training (5th and 6th week): The training program consisting of 10 stations was applied circularly by the participants. After the determined station was made for 45 seconds, it was switched to the other station. 20 seconds rest was applied between each station. A total of 6 sets were applied. 1-2 minutes rest between sets. Participants did the movement form specified at all stations. 10 movement patterns; 1.Rope swinging (each rope weight 12 kg), 2.Hyperextension, 3.Walking lunge (20 kg dumbbells in both hands), 4. Tire & sledgehammer (10 kg), 5.Crunch, 6.Push Press (Olympic Bar + plate; 25 kg), 7. Box jumps (40 cm), 8. TRX-push up, 9. Ab Roller crunch, , 10. Tire flips (28 kg).

Wrestling Technical and Tactical Training (1st and 8th week): Experimental and control groups participated in combined wrestling technical and tactical training three days a week (Tuesday, Thursday, and Saturday) for eight weeks. A HIIT (High Intensive Interval Training) program suitable for the characteristics of the wrestling branch was implemented. Each training session consisted of 10 minutes of warm-up (static and dynamic stretching of the upper and lower extremities after running or jogging), 20 minutes of routine wrestling training, 22-55 minutes of HIIT (eight mixed wrestling techniques), and 10 minutes of cool-down (standard stretching). Wrestling training was carried out as a unit training for an average of 90 minutes (Akhoundnia et.al.,2019).

FINDINGS

Table 2. Intra- Group Body Weight and Percent Body Fat Values of the Participants

Variable		Group	n	Avg.	Std. H.	F	*p*	η²
Body weight (kg)	Pre- Test	Functional	17	78.41	7.66	16.72	0.00**	0.10
		Control	16	80.93	19.19			
	Post-Test	Functional	17	77.79	8.03			
		Control	16	80.01	18.45			
Body fat percentage (%)	Pre-test	Functional	17	11.96	2.82	34.26	0.00**	0.29
		Control	16	12.94	3.92			
	Post-Test	Functional	17	10.73	2.90			
		Control	16	12.34	3.72			

When examining Table 1, it was found that there was a statistically significant difference between the pre-test and post-test values for body weight (F(1, 26.52)=16.72, d=.10, p<.05) and body fat percentage (F(1,13.85)=34.26, d=.29, p<.05). According to the effect size findings, there was a small effect (d=.10) for body weight between the pre-test and post-test values. For body fat percentage, the effect size was also small (d=.29) between the pre-test and post-test values.

Table 3. Inter- Group Body Weight and Percent Body Fat Values of the Participants

Variable	Group	n	Avg.	Std.H.	F	*p*	η²
Body weight (kg)	Functional	17	77.79	8.03	0.14	0.71	0.16
	Control	16	80.01	18.45			
Body fat percentage (%)	Functional	17	10.73	2.90	1.25	0.27	0.48
	Control	16	12.34	3.72			

When examining the post-test values for body weight (F(1,57.57)=.14, d=.16, p>.05) and body fat percentage (F(1,27.67)=1.25, d=.48, p>.05) of the participants, no statistically significant difference was found between the Functional group and the Control group. According to the effect size findings, there was a small effect (d=.16) for body weight between the post-test values of the Functional and Control groups. For body fat percentage, the effect size was also small (d=.48) between the post-test values of the two groups.

Table 4. Intra-group 6-Second Watt Bike Anaerobic Test Values of the Participants

Variable		Group	n	Avg.	Std. H.	F	*p*	η²
Power Average	Pre- Test	Functional	17	877.82	85.60	3.64	0.07	0.05
		Control	16	870.13	202.51			
	Post-Test	Functional	17	896.59	84,00			
		Control	16	892.94	201.58			
Peak Power	Pre- Test	Functional	17	999.71	108.13	17.37	0.00**	0.13
		Control	16	979.00	194.21			
	Post-Test	Functional	17	1059.88	96.72			
		Control	16	1024.81	229.92			

Variable		Group	n	Avg.	Std. H.	F	p	η²
Power Mass (watt/kg)	Pre- Test	Functional	17	11.10	1.10	8.85	0.01*	0.17
		Control	16	10.85	1.72			
	Post-Test	Functional	17	11.59	1.72			
		Control	16	11.24	1.32			

When examining the 6-second Wattbike anaerobic test values of the participants, statistically significant differences were found between the pre-test and post-test values for peak power (F(1,46296.30)=17.37, d=.13, p<.05) and power mass (F(1,3.11)=8.85, d=.17, p<.05). However, no significant difference was observed for power average (F(1,7124.19)=3.64, d=.05, p>.05) between the pre-test and post-test values. According to the effect size findings, power average (d=.05), peak power (d=.13), and power mass (d=.17) variables showed small effects.

Table 5. Inter-group 6-second Watt Bike Anaerobic Test Values of the Participants

Variable	Group	n	Avg.	Std. H.	F	p	η²
Power Average (watt)	Functional	17	896.59	84.00	0.01	0.91	0.02
	Control	16	892.94	201.58			
Peak Power (watt)	Functional	17	1059.88	96.72	0.25	0.62	0.20
	Control	16	1024.81	229.92			
Power Mass (watt/kg)	Functional	17	11.59	1.17	0.47	0.50	0.28
	Control	16	11.24	1.32			

When examining Table 4, power average (F(1.530.84)=.01, d=.02 p>.05), peak power (F(1,12820.81)=.25, d=.20 p>.05), and power mass (F(1,1.52)=.47, d=.28 p>.05) no statistically significant difference was observed between post-test values. When the effect sizes were examined, it was seen that there was a small effect between the post-test values.

Table 6. Intra-group 30-second Watt Bike Anaerobic Test Values of the Participants

Variable		Group	n	Avg.	Std. H.	F	p	η²
Power Average	Pre- Test	Functional	17	576.47	54.50	0.47	0.50	0.01
		Control	16	577.50	119.07			
	Post-Test	Functional	17	580.53	58.92			
		Control	16	565.38	109.46			
Peak Power	Pre- Test	Functional	17	932.41	85.97	0.01	0.95	0.16
		Control	16	954.88	176.65			
	Post-Test	Functional	17	966.47	79.78			
		Control	16	918.88	168.42			
Power Mass (watt/kg)	Pre- Test	Functional	17	7.30	73.00	1.11	0.30	0.08
		Control	16	7.23	99.00			
	Post-Test	Functional	17	7.51	83.00			
		Control	16	7.16	93.00			

When examining Table 5, it can be observed that there were no statistically significant differences between the pre-test and post-test values of power average (F(1,268.14)=.47, d=.01, p>.05), peak power (F(1,15.53)=.01, d=.16, p>.05), and power mass (F(1,.08)=1.11, d=.08, p>.05) for both the Functional and Control groups. The effect size findings indicate that there was a small effect between the pre-test and post-test values for these variables.

Table 7. Inter-group 30-second Watt Bike Anaerobic Test Values of the Participants.

Variable	Group	n	Avg.	Std. H.	F	*p*	η²
Power Average (watt)	Functional	17	580.53	58.92	0.05	0.82	0.17
	Control	16	565.38	109.46			
Peak Power (watt)	Functional	17	966.47	79.78	0.08	0.78	0.36
	Control	16	918.88	168.42			
Power Mass (watt/kg)	Functional	17	7.51	0.83	0.48	0.49	0.40
	Control	16	7.16	0.93			

When examining the post-test values of power average (F(1,822.25)=.05, d=.17, p>.05), peak power (F(1,2603.10)=.08, d=.36, p>.05), and power mass (F(1,.70)=.48, d=.40, p>.05) of the participants, no statistically significant difference was found between the Functional group and the Control group. The effect size findings indicate that there was a small effect between the post-test values of the two groups.

Table 8. Intra-group Strength Values of the Participants

Variable		Group	n	Ort.	Std. H.	F	*p*	η²
Right-hand grip strength (kg)	Pre- Test	Functional	17	50.59	4.28	74.71	0.00**	0.15
		Control	16	51.51	7.69			
	Post-Test	Functional	17	54.09	4.70			
		Control	16	53.48	7.58			
Left-hand grip strength (kg)	Pre- Test	Functional	17	50.51	4.89	103.34	0.00**	0.02
		Control	16	50.36	7.97			
	Post-Test	Functional	17	53.46	4.57			
		Control	16	53.10	7.93			
Back Strength (kg)	Pre- Test	Functional	17	143.24	17.33	3.97	0.06	0.27
		Control	16	138.28	18.90			
	Post-Test	Functional	17	147.81	22.16			
		Control	16	141.19	17.84			

When examining the participants' right-hand grip strength (F(1, 122.99)=74.71, d=.15, p<.05) and left-hand grip strength (F(1, 133.74)=103.34, d=.02, p<.05), statistically significant differences were found between the pre-test and post-test values in both groups. However, for the variable of back strength (F(1, 230.39)=3.97, d=.27, p>.05), no statistically significant difference was observed between the pre-test and post-test values for both groups. The effect size findings indicate that there was a small effect between the pre-test and post-test values for all three variables.

Table 9. Inter-Group Strength Values of the Participants

Variable	Group	n	Avg.	Std. H.	F	*p*	η²
Right-hand grip strength (kg)	Functional	17	54.09	4.70	0.01	0.94	0.10
	Control	16	53.48	7.58			
Left-hand grip strength (kg)	Functional	17	53.46	4.57	0.01	0.91	0.06
	Control	16	53.10	7.93			
Back Strength (kg)	Functional	17	147.81	22.16	0.82	0.37	0.33
	Control	16	147.81	17.84			

When examining Table 8, it can be observed that there were no statistically significant differences between the post-test values of the groups for right-hand grip strength ($F(1, .40)=.01$, $d=.10$, $p>.05$), left-hand grip strength ($F(1, 1.07)=.01$, $d=.06$, $p>.05$), and back strength ($F(1, 551.92)=.82$, $d=.33$, $p>.05$) variables. The effect size findings indicate that there was a small effect between the post-test values of the groups for all three variables.

CONCLUSION and DISCUSSION

In this study, the aim was to examine the performance values of male wrestlers who actively continue wrestling through Functional Strength Training. According to the results of this study, it can be said that Functional Strength Training is effective in strength production and maintenance. As Functional Training is a contemporary approach and a relatively new method used in training models, the reviewed literature on this topic is relatively limited.

Functional training is defined as "training that meets the specific requirements of a particular sport." In this training method, all movement patterns should be specific to the sport being practiced (Boyle, 2016). Functional training is believed to be a superior training method in certain aspects compared to other training methods that focus on isolated movements, which is why it is considered to be beneficial for athletic performance improvement in today's context (Santana, 2015).

The way and content of functional exercises are far from the isolated structure of other strength training. As seen in studies, functional strength training has been shown to reduce body fat percentages (Haddock, 2016; Feito, 2018; Cadegiani, 2019). According to the results of the study, it was observed that the group performing functional strength training decreased statistically more in fat mass and ratio compared to the control group, and there was a statistically significant decrease in itself according to the pre-test and post-test results. This may be because functional training is a relatively more dynamic training method (Liebenson, 2014). It is known that the amount of energy expended increases as the number of body proportions involved during a movement increases (Kumahara, 2004; Tsurumi et al., 2002). The dynamic nature of high-intensity functional training, away from isolated exercises, may suggest that more energy is spent (Willis et al., 2019).

It is known that functional training provides versatile gains due to their advanced movement patterns (Tomljanović, 2011; Baldon, 2012). Weiss et al. In 2010, they compared traditional strength training and functional strength training. At the end of the study, close developments were observed between functional strength training and traditional strength training (Weiss, 2010). Kieffer et al., on the other hand, compared strength training performed on a machine with functional training in 2005. As a result of the study, machine training for the upper extremity was more effective, while the results were close for the lower extremities (Kieffer, 2005). In the study conducted by Labib (2014), it was reported that there was no significant change in hand grip and back strength values in female handball players after 10 weeks of functional strength training. Similarly, Elbadry (2014) found no significant improvement in hand grip and back strength scores among female athletes in the hammer throw discipline after eight weeks of functional strength training. The lack of significant changes in hand grip and back strength scores within the groups aligns with the findings in the existing literature. However, in sports such as wrestling, functional training may be considered effective for enhancing athletic performance.

The areas examined in the literature regarding functional training are somewhat limited unless the training is of high intensity. This limitation can be attributed to the origin of functional training, which initially focused on the treatment of sports injuries and the rehabilitation of individuals facing various physical challenges (Beckham, 2010). However, the current approach of using functional training for enhancing athletic performance has led to the understanding of its various effectiveness, and it is now being applied in the context of athletic performance as well.

Wrestling is a highly demanding contact sport that requires complex skills and intensive use of strength, primarily relying on the anaerobic energy system (Yoon, 2002). Due to its short and high-intensity nature, anaerobic strength is a crucial performance indicator in wrestling and should be developed through training (Chaabene, 2017). In a study conducted by Mcweeny et al. in 2020, traditional strength training was compared with high-intensity functional training, and various performance parameters were examined. They found that the 5-second peak power scores were statistically lower in functional training, while the 30-second upper extremity peak power showed the greatest improvement in functional training; however, this difference was not statistically significant. Nevertheless, the study showed statistical differences in multi-joint and compound movements in the functional training group (Mcweeny, 2020). In another study by Ma and Thongdecharoen (2023) on amateur boxers, no significant differences were found in anaerobic power values after the functional strength training period. On the other hand, Caglayan et al. (2017) conducted functional strength training on Muay Thai athletes, looking into various performance parameters. In this study, they looked at various performance parameters. At the end of the study, an increase was observed in anaerobic capacity, minimum power output, fatigue index, and average power output (Caglayan, 2017). Some of the parameters we obtained as a result of our study show similarity. Significant differences were observed in the 30-second peak power outputs compared to the control group, but no difference was observed in the 30-second anaerobic average power. This difference can be thought to be caused by intense instantaneous lifts and combined movements during training. In the 60-second strength tests, no significant differences were observed in terms of group time interaction. This may suggest that functional exercises are not sufficient to maintain anaerobic power due to the relatively long duration. It is also a physiologically limiting time for anaerobic power outputs in one minute.

Change In conclusion, the functional strength training group exhibited improvements in several performance parameters, including reductions in body weight and body fat percentage, as well as an increase in right-hand grip strength, following an 8-week training period. Structuring functional strength training practices as a supportive training model is thought to be more effective. Structuring functional strength training practices as a supportive training model is thought to be more effective. Effective planning of the pre-injury prevention phase is recommended before increasing the effectiveness of multi-joint motion applications at high load ranges.

SUGGESTIONS

• Increasing the applicability of functional strength exercises in different age groups of both sexes

• Functional strength exercises can be applied to coaches as a complementary training model in pre-season and in-season

• Functional strength exercises reflecting the technical characteristics of sports branches can be planned

• Functional strength exercises can be added to the training programme of athletes to prevent injury or after injury

ETHICAL TEXT

In articles, the rules in the text below should be followed and a text similar to the text below should be added to the article under the title of ethical text.

“This article complies with journal writing rules, publication principles, research and publication ethics, and journal ethics. Responsibility for any violations that may arise regarding the article belongs to the author(s). Ethics committee approval of the article was obtained by Kütahya Dumlupınar University/Publications Ethics Committee with its decision dated 30.11.2021 and numbered 2021/09.

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