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# The Impact of Combined Training Schedule on Selected Anthropometric and Basic Motor Characteristics of the Wrestlers

*Adnan Ersoy*

Dumlupınar University School of Physical Education and Sport, Turkey

**Abstract:** This study aimed to research into the impact of the 8-week combined strength training schedule for wrestlers on the selected anthropometric and basic motor qualities. 24 athletes – 14 athletes in the experiment group and 10 in the control group – working out in accordance with regular training schedules for 2 hours a day and 3 days a week voluntarily took part in the study. The measurements were performed on the selected 8-week pre-training (PRT) and post-training (POT) anthropometric and basic motor qualities of the experimental and control groups. The evaluation of the data was conducted through the SPSS package program. Data scores were presented as mean and standard deviation. The student t was the test performed in the dependant groups for the evaluation of pre-training and post-training scores. $p<0.05$ was adopted as a level of significance. When the PRT and POT scores of the experimental subjects were compared as a result of the 8-week combined strength training schedule, it was found out that the experimental subjects had a $p<0.01$ level of difference in their leg strength, left-hand grip strength, relative peak power, relative average power, jumping power and station lane score whereas there was a significant ($p<0.05$) difference in right-hand grip strength, Wingate peak and average power scores. The control group, on the other hand, turned out to have a significant difference ($p<0.05$) only in Wingate peak power scores.

**Keye words:** Combined Training Schedule · Anthropometric · Basic Motor Characteristics · Wrestlers

## INTRODUCTION

Having thousands of athletes and fans all around the world, the wrestling is defined as two men's competition to gain and maintain a superior position on a mat in a specific size using their technique, skill set, strength and intelligence without any tool in accordance with rules set out by International Wrestling Federation. Human body systems need to be operating in order to meet the energy need as a result of this competition and withstand the fatigue [1]. That the wrestling is performed at a high tempo in recent years has necessitated trainings to be painstakingly planned and programmed for game preparations. It is no longer enough to have the technical capacity and tactical competency on paper in order to come out on top. Theories, training methods, biomechanics, physiology, measurement and evaluation of the wrestling have nowadays become major factors for game preparations of wrestlers. The wrestling is defined as a sports branch in which anaerobic energy system is predominantly employed and the factors such as speed, strength, pace, flexibility, balance, muscular and cardiovascular stamina and coordination have an impact on the performance [2-4]. Amendments of the International Wrestling Federation on the rules have led to revisions in training methods as well. Being able to adjust to these new rules requires a decent preparatory period for wrestlers. It is, therefore, a requisite in the trainings of this preparatory period to put forward energy systems and power that the wrestlers will benefit from in the competitions, analyze them in detail and set out training schedules accordingly [5].

What lies behind the significant increase in the performance of an athlete is to discover superior abilities at a young age and put them regularly and reasonably through training. Modern wrestling coaches can evaluate the efficiency of training schedules through scientific tests whilst having their wrestlers prepare for championships. They can compare test results with previous one, ascertain positive and negative changes in anatomical and functional qualities of wrestlers and thus reorganize training schedules [6].

**Corresponding Author:** Adnan Ersoy, Dumlupinar University School of Physical Education and Sport, Turkey.
Tel: +902742270450.

The impact of the strength on the success in all sports disciplines is a fact acknowledged by everyone. The quality and quantity of the strength particularly in heavyweight sports take on a new meaning. The strength and permanence in strength are analyzed by proportioning the body weight of the athletes as well as the strength they generate per their body weight [7-10].

This study aimed to research into the impact of the 8-week combined strength training schedule for wrestlers on the selected anthropometric and basic motor qualities.

## MATERIALS AND METHODS

**Experimental Subjects:** The study ascertained age average of the experimental group as 20.28±2.43 year, of the control group as 21.00 ±1.94 year, the height average as 173.57±7.80 cm for experimental group, 173.85±7.861 cm for control group and the weight average as 79.03 ±15.37 kg for experimental group and 85.80±19.40 kg for control group. 24 athletes–14 athletes in the experiment group and 10 in the control group – working out in accordance with regular training schedules for 2 hours a day and 3 days a week voluntarily took part in the study.

**Evaluation Method:** The measurements of parameters consisting of height, weight and body composition of the experimental and control groups were performed prior to the study. Their anaerobic power and capacity were measured by Wingate test (Monark 894 E peak bike) as their vertical jumping and 20-meter sprinting measurements were carried out by Newtest (Newtest power timer 300 series). Right and left clutch and leg strength were put on a test by a dynamometer. The tests were repeated following the 8-week training.

**Training Schedule:** In a single training, the athletes individually warmed up for 10 minutes and for another 10 minutes as pairs and then performed circuit training. The athletes were allowed to take 10 minute active recreation in the circuit training (4 repetitions in the first two weeks). The number of repetitions was periodically increased in circuit trainings (6 repetitions in the 3rd, the 4th and the 5th week) (8 repetitions in the 6th, the 7th, the 8th week).

**Graph 1:** Lane of the combined training

The following exercises were performed in combined training lane.

**Circuit 1:** The experimental subjects performed 8 recurrent dips following the sliding move where their arms were stretched in parallel bars.

**Circuit 2:** The experimental subjects performed 8 jumps to the right and to the left when their arms were loose on a gymnastic bench at 30 cm. height.

**Circuit 3:** The experimental subjects performed 8 recurrent pull-ups in pull-up machine.

**Circuit 4:** The experimental subjects performed jackknife move for 8 times.

**Circuit 5:** The experimental subjects performed 20-meter sprinting.

**Circuit 6:** The experimental subjects performed slalom moves around 5 barriers at 45 cm height, 145 cm tall and 20 cm width (50 cm between the barriers).

**Circuit 7:** The experimental subjects performed technical exercises with pairs at the same weight.

7-a; The experimental subject shouldered his pair and performed half-squat move for 8 times.
7-b; The experimental subject pulled up his pair to his chest level gripping his waist and lowered him in a way where his foot would touch the floor and performed the same move for 8 times (waist hold).
7-c; The experimental subject weighed his pair with one arm technique. This move was performed 4 times to the right side and 4 times to the left side.
7-d; The experimental subject performed gut wrench move 4 times to the right and 4 times to the left on his pair who was in a stable and face-down position.

**Circuit 8:** The experimental subject passed under the barrier which was 3 meter tall, 10 cm at width and 70 cm at height and touched 4 spots previously specified and crossed the barrier.

**The analysis of the data:** SPSS (Statistical Package for the Social Sciences) package program was employed for the analysis of the data. The results of the measurements were presented in mean (M) and standard deviation ($S_D$). One-Sample Kolmogorov-Smirnov test was referred to test whether the data had shown a normal indication of dispersion and the data turned out to do so.

Table 1: PRT and POT Anthropometric Measurement Scores of the Experimental and Control Groups

| | Experimental Group (n=14) | | | Control Group (n=10) | | |
|---|---|---|---|---|---|---|
| | PRT | POT | | PRT | POT | |
| Parameters | M±$S_D$ | M±$S_D$ | t-score | M±$S_D$ | M±$S_D$ | t- score |
| Age (year) | 20.28 ±2.43 | 20.28 ±2.43 | - | 21.00±1.94 | 21.00±1.94 | - |
| Height (cm) | 173.57±7.80 | 173.57±7.80 | - | 173.85±7.861 | 173.85±7.86 | - |
| Weight (kg) | 79.03 ±15.37 | 79.07±14.80 | -0.09 | 85.80±19.40 | 86.60±19.01 | -1.39 |
| Biceps Skinfold (mm) | 4.65±2.00 | 4.71±1.96 | -1.07 | 6.51±2.17 | 6.68±1.92 | -0.95 |
| Triceps Skingold (mm) | 9.70±4.76 | 9.81±4.71 | -1.66 | 13.79±4.40 | 13.84 ±2.99 | -0.04 |
| Subscapular Skinfold (mm) | 11.32±3.25 | 11.52±3.33 | -1.80 | 16.87±6.16 | 16.83±6.15 | 1.50 |
| Suprailiac Skinfold (mm) | 10.64±3.85 | 11.98±7.90 | -0.95 | 23.14±13.45 | 23.02±12.77 | 0.40 |
| Abdomen Skinfold (mm) | 18.00±8.70 | 18.21±8.54 | -0.86 | 28.00±12.52 | 28.14±12.48 | -0.63 |
| Thigh Skinfold (mm) | 13.92±7.05 | 14.12±7.05 | -1.28 | 16.56±5.21 | 16.60±5.14 | -1.00 |
| Calf Skinfold (mm) | 14.28±4.39 | 14.22±4.51 | 0.27 | 15.08±5.17 | 15.02±5.197 | 0.48 |
| Chest Skinfold (mm) | 7.44±3.12 | 7.64±3.08 | -1.31 | 13.12±5.60 | 13.04±5.28 | 0.39 |
| Thigh Skinfold (cm) | 56.40±5.49 | 56.66±5.73 | -1.17 | 57.90±6.82 | 58.07±6.86 | -0.89 |
| Calf Circumference (cm) | 37.65±3.83 | 37.58±3.56 | 0.38 | 39.30±3.40 | 39.34±3.48 | -0.26 |
| Flex. Biceps Circumference (cm) | 35.62±3.19 | 35.44±3.23 | 1.65 | 36.05±4.71 | 36.23±4.70 | -1.00 |
| Wrist Circumference (cm) | 17.53±0.94 | 17.55±0.96 | -1.00 | 17.90±1.50 | 17.90±1.50 | - |

Table 2: PRT and POT Basic Motor Quality Scores of the Wrestlers in Experimental and Control Groups

| | Experimental Group (n=14) | | | Control Group (n=10) | | |
|---|---|---|---|---|---|---|
| | PRT | POT | | PRT | POT | |
| Parameters | M±$S_D$ | M±$S_D$ | t-score | M±$S_D$ | M±$S_D$ | t- score |
| Leg Strength | 156.46±28.20 | 192.39±37.2 | -4.17* | 158.95±22.71 | 156.31±26.29 | 0.88 |
| Right-hand Grip Strength | 49.07±9.72 | 51.67±9.49 | -2.42** | 51.32±8.44 | 49.84±7.52 | 1.58 |
| Left-hand Grip Strength | 46.73±6.63 | 50.75±8.20 | -3.46* | 50.79±8.11 | 49.71±7.46 | 1.17 |
| Wingate Peak Power | 851.94±158.71 | 922.73±169.08 | -2.76** | 904.23±222.91 | 886.43±182.55 | 0.19 |
| Wingate Peak Power/ Kg | 10.80±0.76 | 11.73±1.32 | -3.13* | 10.34±1.10 | 10.41±1.32 | -0.13 |
| Wingate Average Power | 621.31±112.39 | 649.23±119.69 | -2.88** | 615.87±123.39 | 617.51±111.24 | -0.24 |
| Wingate Average Power / Kg | 7.87±0.38 | 8.22±0.44 | -3.07** | 7.19±0.5 | 7.27±0.65 | -0.95 |
| 20 meter sprint (sn) | 3.13±0.19 | 3.07±0.21 | 1.14 | 3.11±0.15 | 3.23 ±0.21 | -1.76 |
| Vertical Jumping Height | 37.47±5.03 | 41.22±4.38 | -3.05* | 35.90±3.63 | 36.59±4.31 | -1.15 |
| Lane | 2.77±0.33 | 1.74±0.35 | 11.03* | 2.88±0.30 | 2.87±0.35 | 0.11 |

* P< 0.01, ** P < 0.05

Student t rest was performed for the evaluation of the pre-training and post-training scores in dependant groups. p<0.05 was considered as the level of significance.

**Findings:** When the impact of 8-week combine strength training schedule on the selected anthropometric qualities of the wrestlers was analyzed in Table 1, it was found out that there were changes in parameters in parallel with the applied training schedule but these changes were not statistically significant.

When the impact of 8-week combine strength training schedule on the basic motor qualities of the wrestlers was analyzed in Table 1, it was found out that the changes in 20 meter sprint parameter in parallel with the applied training schedule were not statistically significant even though changes of other parameters were significant.

## DISCUSSION AND CONCLUSION

This study, with a view to ascertaining the impact of 8-week combine strength training schedule on the selected anthropometric and basic motor qualities of the wrestlers, led to the fact that there were developments in parallel with the regularly applied loading items. No significant difference was found in age average, height and weight of the experimental groups who resemble each other in terms of physical qualities. Aydos *et al*. [11] in their studies on 66 wrestlers with an average age of

19.53±1.61 year found out that the height of the wrestlers was 1.73±0.07 cm as their weight was 76.77±14.41 kg. The scores specified in their studies bear resemblance to the scores of our study.

The study pointed out that pre-training leg strength score of the experimental group was 156.46±28.2 kg while the post-training scores rose to 192.39±37.2 kg and that increase was statistically significant (p<001). The pre-training and post-training leg strength scores of the control group were 158.95±22.7 kg and 156.31±26.2 kg. When the scores of both groups were compared, the pre-training difference turned out to be insignificant even though the post-training scores were a significant difference (p<005).

Hazar *et al*. [12] found out in their studies, with a view to ascertain the impact of losing weight for wrestlers on serum testosterone and cortisol levels and its relation with stamina, quick power, basic power and $MaxVO_2$ that the leg strength was 181.76 kg prior to weight loss and 191.76 kg following the weight loss and ascertained that the difference between these two measurements was significant. Ergen *et al*. [13] measured the leg strength average of oil wrestlers at 187 kg. in their studies with a view to ascertaining the physiological profile of the oil wrestlers. Aydos *et al*. [14] found out in their studies with a view to ascertaining the relation between strength measurements and some anthropometric parameters in young-elite wrestlers that the leg strength was 140.27±31.89 kg. Şenel *et al*. [15] measured the leg strength at 136.9 kg in their studies on 31 wrestlers with an average age of 21. Housh *et al*. [16] reported in their studies in which they measured forearm and leg strength of 197 high-school wrestlers with an average age of 16.36 on Cybex 2 isokinetic dynamometer that the strength ratio increased along with the fat-free mass. When the right-hand grip strength developments of experimental subjects following the training Schedule were analyzed, the right-hand grip strength scores, 49.07±9.72 kg prior to the training, turned out to statistically have a significant increase (p<005) and rose to 51.57±9.49 kg. The right-hand grip strength, 51.32± 6.44 kg prior to the training, decreased to 49.84±7.52 kg following the training. There was no significant difference found between two groups in terms of pre-training and post-training averages of right-hand grip strength. When the left-hand grip strength of the experimental subjects in the study was analyzed, the left-hand grip strength scores of the experimental group athletes, 46.73±6.63 kg prior to the training, rose to 50.75±8.20 kg and this increase was statistically significant. The left-hand grip strength scores of the control group, 50.79±6.11 kg prior to the training, decreased to 49.71±7.46 kg following the training. The difference between the pre-training and post-training averages of left-hand grip strength for both groups was insignificant.

Ziyagil *et al*. [6] in their analysis – over a year - on the physiological qualities of National Team wrestlers under 16-17 suggested that the right and left hand grip strength of the wrestlers had increased. The researchers pointed out that the grip strength in both hands significantly increased (p<0.05). Song and Cipriano [17] in their studies with a view to observing the 4-month training schedule on wrestlers reported that the right-hand grip strength was 51.1 kg prior to the training and 52.2 kg. afterwards as the left-hand grip strength was 49.1 kg. prior to the training and 49.9 kg. afterwards. Scott [18] measured the dominant hand grip strength of 8 wrestlers at 50.4±13.2 kg and the non-dominant hand grip strength at 48.3±13.5 kg. Freischlag [19] (1984) researched into the dominant hand grip strength of 104 young wrestlers every other year and measured it at 36.6 kg in the first measurement and 49.9 kg. in the second measurement. Within the framework of the same study, Baykuş [20] measured the right hand grip strength of 18 wrestlers at 43.7 kg. and the left-hand grip strength at 39.5 kg while the right hand grip strength of 18 Greco-roman wrestlers was at 40.7 kg and the left-hand grip strength at 38.2 kg.

A wrestler must benefit from his strength trying to push, pull and oppose his opponent. The strength measurements are of vital importance in wrestling. Cisar *et al*. [21] suggest that the forearm and leg strength are decisive en route to success in wrestling. Our study points out that the significant increase in the right and left hand grip and leg strength of the wrestlers results from the training peculiar to the wrestling.

The pre-training peak power developments of the experimental group, 851.94±158 watt, rose to 922.73±169 watt following the training and this increase was statistically significant. The peak power scores of the control group, 904.43±223 kg prior to the training, were 886.43±182 watt following the training. There was no significant difference between the experimental and control groups in terms of pre-training and post-training peak scores.

The relative peak power scores of the experimental group, 10.60±0.76 watt prior to the training, rose to 11.73±1.32 watt following the training and this increase was statistically significant (p<001). The relative peak power scores of the control group, 10.34±1.10 watt prior to the training, rose to 10.41±1.32 watt following the

training. There was no significant difference between two groups in terms of pre-training and post-training scores of relative peak power.

The Wingate test is performed to ascertain the maximum power capacity of the wrestlers [22]. Vardar *et al*. [23] found out that the relative peak power average scores of female wrestlers with an average age of 16.2 were 5.0 watt as the average scores of male wrestlers with an average age of 17.3 were 6.3 watt. Horswill *et al*. [24] reported in their studies that elite-male wrestlers (age: 17.0 ± 0.2 year) had a 8.6 W/kg average power score. The highest power scores of our study, however, were higher than they were in the studies of Horswill *et al*. [24] and Vardar *et al.* [23] The fact that the scores of our study were higher than the scores in other studies was believed to result from Wingate Test loading methodology and age difference. It was, however, reported that the peak anaerobic power of the male wrestlers in Brigham University Junior Wrestling Team was 10.78 watt/kg as the peak anaerobic power of the Korean national wrestlers was 10.78 watt/kg, [22]. There was no statistically significant difference reported when the pre-training 20-meter sprint test of the experimental group was measured at 3.13±0.19 sec and 3.07±0.21 sec following the training. There was no statistically significant difference reported when the pre-training 20-meter sprint test of the control group was measured at 3.11±015 sec and 3.23±0.21 sec following the training.

Kürkçü *et al*. [25] measured 20 meter sprint scores of the wrestlers at 3.76 sec prior to a 12-week wrestling training and at 3.71 afterwards. Kılıç *et al*. [26] reported that 20-meter sprint test scores of the wrestlers at the age of 14-16 on whom they put a quick power training were at 3.48 sec prior to the training and 3.39 afterwards. 20-meter sprint test scores of the control group were at 3.61 sec prior to the training and 3.49 afterwards. The athletes taking part in this study had resemblance with the scores of other athletes in 20-meter sprint tests.

The vertical jumping scores of experimental group athletes were at 37.47±5.03 cm prior to the training and 41.22±4.38 cm afterwards. This increase was statistically significant ($p<001$). The vertical jumping scores of control group athletes were at 35.90±3.63 cm prior to the training and 36.59±4.31 cm afterwards.

Kürkçü *et al* [27] in their studies with a view to ascertaining the seasonal changes in body fat percentage, strength, flexibility, aerobic and anaerobic qualities of the Greco-roman wrestlers at the age of 12-13 observed a significant increase ($p<0.01$) in the vertical jumping scores of the experimental group. The pre-season vertical jumping average was 37.08±5.16 cm as the post-season average was 43.25±5.17 cm. Kılıç *et al*. [26] recorded a significant increase – in their studies on the wrestlers at the age of 14-16 - in vertical jumping scores of the experimental group athletes following 8-week quick power training. Akbal [5] in his study with a view to ascertaining the impact of physical exercises on the muscular strength reported that the pre-season vertical jumping average of the experimental group was 49.00±5.00 cm as the post-season average was 53.00±5.00 cm. There was a significant difference ($p<0.05$) between both measurements. The vertical jumping parameters of the wrestlers in this study bear resemblance to the other studies in the literature.

The combined training lane scores of the experimental group turned out to be 2.77±0.33 min prior to the training and 1.74±0.35 min afterwards. This increase was statistically significant ($p<0.05$). The scores for the control group were 2.88±0.30 prior to the training and 2.87±0.35 min afterwards.

In conclusion, it was found out that the wrestlers improved their selected anthropometric and basic motor qualities following 8-week combined strength trainings. Identification for the 8-week improvements of the wrestlers will shed light on future studies and be an indicator for training schedules to be set out with a view to improving the performance of athletes. It is believed that more elaborate studies would be beneficial in order to monitor the efficiency of specific training schedules as well as the body composition and physical fitness of the athletes.

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