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THE EFFECT OF 8-WEEK FAST STRENGTH TRAINING ON MIXED MARTIAL ATHLETES AND BOXERS

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Abstract:
Objective: The aim of this study was to investigate the effect of 8-week explosive strength training on competitive MMA athletes and Boxers. Subjects were of mean age 22.63±5.45 years, and the experience of training mean 10.40±2.62. **Method:** In this study, a total of 32 athletes participated in the training as competing athletes in KDS and boxing branches of GNP Sports Club. The KDS and Boxing groups consisted of 16 people, each of which was an experimental and a control group. Before and after trainings, Bench Press, Bench Pull, Squat 1 RM tests, Vertical Jump, Anaerobic Power and Hextagon Agility tests were taken. While the control groups continued their technical trainings, the experimental groups carried out explosive strength training 3 days a week for 8 weeks in addition to technical training. The data obtained were analyzed in the SPSS 22.0 package program. **Results:** At the end of the 8-week period, when experimental group pre- and post-test values were compared in 1 RM Bench Press, Squat, Bench Pull and Vertical Jump values, statistically significant difference was found ($p<0.05$). In the boxer experimental group, in 1 RM Bench Press, Squat, Bench Pull, Vertical Jump, Hextagon Agility test values statistically significant difference was found ($p<0.05$). 1 RM test Squat, Bench Pull, Vertical Jump values of both experimental groups statistically significant differences were found. ($P> 0.05$). There was no statistically significant difference between 1 RM Bench Press and Hextagon Agility test values ($P> 0.05$). In the control groups, there was no statistically significant difference in the values of 1 RM Squat, Bench Pull, Vertical Jump, Hextagon Agility test ($p> 0.05$). In the 1 RM Bench Press test, a statistically significant difference was found ($P> 0.05$). **Conclusions**: As a result, 8-week fast strength training applied to the experimental groups of boxers and MMA athletes 1 RM Bench Press, Bench Pull and Hextagon Agility, has been developed to improve the values. 1 RM Squat and Vertical jump test values did not improve.

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1. Introduction

Wrestling is a game of strength and intelligence. When these two superior virtues are combined in a person, he can only do great things. It is a struggle between two athletes without using any materials and tools, within certain rules, for a certain period of time and on a certain area, using all their physiological and psychological powers to bring each other down or to provide technical superiority (Tutar et al. 2024).

Boxing has been a sport followed with great curiosity and excitement by the masses for centuries. Today, it is given great importance both in amateur and professional terms. Hundreds of athletes from all over the world compete fiercely to make it to the Olympics. Professionally, it is a highly motivating sports branch with athletes' million-dollar earnings and sponsor support. Mixed Martial Arts (MMA) is one of the most interesting sports branches today, although it is not old compared to boxing. It is a unique and complex sport that uses kicks, punches, wrestling techniques, and close martial arts.

Traditional mixed martial arts are boxing, kickboxing, wrestling, Brazilian Jiu Jitsu (BJJ) and karate (Lachlan et al. 2013). Apart from being unique, complex and traditional, due to the diversity of attacks found in CF and the aforementioned sports, having advanced motor skills and physical strength is one of the necessary characteristics to be successful in this sport (Lachlan et al. 2013).

The aim of this study as to examine the effect of 8 weeks of quick strength training on the performance of athletes and boxers between the ages of 18-28 years who are competitors and who are doing KDS. One repetition maximal Bench Press, Squat, Bench Pull, Vertical Jump, and Hextagon Agility test will be applied to the athletes before and after the exercises. The test results will be statistically analyzed and it will be tried to determine for which branch the study is more suitable. The hypothesis of this study is that the performance increase in the experimental groups will be more than the control group.

2. Material and Methods

The participants of the study were 32 athletes who actively participated in training at the Ground and Pound sports club operating in the Nişantaşı region of Istanbul Province. Participants voluntarily participated in this study. There were 16 boxers (8 control and 8 experimental) and 16 mixed martial athletes (8 experimental and 8 control), 32 athletes in total. The age range of the participants was determined as 18-28. The height, weight, age, athletic age and body fat percentage of the athletes were used as descriptive statistics.

The weight differences were taken into consideration in the distribution of the groups, and it was ensured that the weights that were close to each other were in the same group without taking into account the age and rank of the athletes. The study was approved by the Kocaeli University Clinical Research Ethics Committee with project number 2018/211 and decision number 2018/12.3. This research was carried out with the

voluntary participation of the athletes, and the athletes were shown how to perform the tests and their questions were answered before proceeding to all tests. All studies were performed for 2 hours 3 days a week for 8 weeks, including open mat training. Necessary warm-up and flexibility exercises were performed before all exercises.

Data collection was carried out in the indoor facilities of Ground and Pound sports club. All participants were asked to avoid alcohol, caffeine and ergogenic aids and to sleep for at least 8 hours the day before the test. This study was conducted in a 32-member defense sports team with two different branches of 16 athletes separated according to branches and 2 groups as experimental and control groups within the branches, in total 4 different groups. While the control group of 16 people continued their technical trainings, the experimental groups participated in quick strength trainings applied 3 days a week for 8 weeks in addition to technical trainings.

2.2 Training Protocol

The training started three days a week with 15-20 minutes of warm-up and 15 minutes of stretching before each training. In the first 4 weeks of the study, station training consisting of branch-specific movements was performed. From the 5th week of the study, an additional weighted training program started to be applied. Station work consisted of 8 different movements and stations. The duration of the exercises and movements in the program is 30 seconds. Between the exercises, 30-45 seconds of rest was given. The exercises were performed at maximal tempo. The exercises consisted of 3-4 sets, and 5 minutes of active rest was given between the sets. As the training progressed, the intensity of the load was increased by extending the training time and shortening the rest according to the developmental status. The acute variables and protocols of the applied trainings are shown in detail.

The station training exercises consisted of Jump Squat, Push Up, Russian Twins, Trx row, Cooperative Pummeling (mutual shoulder push), Shadow Boxing, Sprow, Bridge and Pull (bridge and reach) movements. Additional weighted exercises were performed according to the circular training method. While one athlete performed one movement, the other athlete performed another movement, and thus, 8 athletes actively participated in the training at the same time. The movements performed were: Split Squat, Bent Over Barbell Row, Dumbbell Floor Press, Dumbbell Push Press, Barbell Back Squat, Single arm Snatch, Kettebell Swing, Single arm Row.

2.3 Body Weight and Height Measurement

The height of the participants was measured with a wall-mounted stadiometer (Holtain) with an accuracy of ±0.1 mm. The measurements were taken with heels together, head upright and eyes looking straight ahead. The body weights of the subjects were measured with a Seca weighing scale with an accuracy of ±0.1 kg, barefoot and in an anatomical posture wearing only underwear (Sarı, 2025).

2.4 Body Fat Percentage

Subcutaneous fat was measured with a Fabrication Enterprises caliper by grasping the skin and subcutaneous fat with the thumb and index finger and pulling it away from the muscle tissue. Measurements were taken from 2 regions, leg and subscapula. Body fat percentages were calculated by the Sloan and Weir formula (Tamer 2000).

2.5 Vertical Jump

The vertical jump value was calculated from the difference between the extreme point reached by extending the arm and the extreme point reached by jumping with the help of a meter marked on the wall. The anaerobic power of the subjects was calculated by Lewis Nomogram using vertical jump and body weight values. The values were recorded in kg.m/sec (Tamer 2000).

2.6 Repetition Maximum (1TM) Force Measurements

Strength measurements were made at Ground and Pound Hall. The barbell and plate used for strength measurements are Mussle Up brand. Measurements were determined as Bench Press, Bench Pull for upper extremity and Squat for lower extremity and taken in this way. While taking the measurement, the movement technique was applied in an orderly manner. The test protocol was performed in the following order and continued until the participants' 1 repetition maximal values were found. 1Repeat Maximal measurements were taken on the 5th test trial (Bounty et al. 2011)

2.7 Agility Test

For the Hexagon agility test measurement of the subjects, a hexagon with a side length of 60.5 cm and corner angles of 1200 was drawn on a non-slip surface. The face of the subject was always set to face point A, and the stopwatch was started when the subject jumped from line A to line B. The stopwatch was stopped when the subject jumped from the center of the hexagon to each side of the hexagon, rotated 3 turns and returned to the starting point. The value was recorded in seconds.

2.8 Statistical Analysis

The data were obtained using the SPSS 22.0 package program. In order to determine the normality distribution of the data and the statistics to be applied, the Wilkes test was used, and it was determined that the data had a normality distribution. The arithmetic averages and standard deviation values of all variables were calculated with descriptive statistics. The paired samples t-test was used to determine the difference between the pre-test and post-test within the group, and the independent samples t-test was used to determine the difference between the pre-test and post-test between the groups and the differences in development between the groups. The significance level $p<0.05$ was taken.

3. Results

Statistical evaluations related to the age, height, body weight and body mass index of the carma fighting participating in the study are shown in Table 1. Statistical evaluations related to the age, height, body weight and body mass index of the boxers participating in the study are shown in Table 2.

Table 1: Demographic data of carma fighting group

Groups	Variables	N	Minimum	Maximum	Mean	SD
Control	Age, year	8	18	28	22.87	4.18
	Height, cm	8	171.3	181	178.37	3.73
	Weight, kg	8	64	83	73.75	6.20
	Body fat percantage	8	9.77	15.47	13.04	2.08
	Training Year	8	7	12	9.62	1.68
Experimental	Age, year	8	18	26	20.37	3.46
	Height, cm	8	170	190	178.87	6.56
	Weight, kg	8	63	85	74.21	6.33
	Body fat percantage	8	9.77	13.17	13.04	2.08
	Training Year	8	7	14	10	2.39

The mean age of the control group was 22.87 ± 4.18 years, the mean training age was 9.62 ± 1.68 years, the mean height was 178.37 ± 3.73 cm, the mean body weight was 73.75 ± 6.20 kg, and the mean fat percentage was 13.04 ± 2.083 %. The mean age of the experimental group was 20.37 ± 3.46 years, the mean training age was 10.0 ± 2.39 years, the mean height was 178.87 ± 6.56 cm, the mean body weight was 23.15 ± 1.51 kg, and the mean fat ratio was 11.11 ± 1.35 %.

Table 2: Demographic data of the boxer group

Groups	Variables	N	Minimum	Maximum	Mean	SD
Control	Age, year	8	21	28	25.37	2.72
	Height, cm	8	173	181	178	2.82
	Weight, kg	8	68	86	75	5.65
	Body fat percantage	8	10.35	16.08	14.12	2.08
	Training Year	8	7	16	11.37	3.15
Experimental	Age, year	8	18	28	23.87	3.87
	Height, cm	8	170	180	176.5	4.92
	Weight, kg	8	64	89	74.50	6.86
	Body fat percantage	8	12.04	17.22	14.19	1.96
	Training Year	8	8	15	11.37	2.55

The mean age of the boxer control group was 25.37 ± 2.72 years, the mean training age was 11.37 ± 3.15 years, the mean height was 178.0 ± 2.82 cm, the mean body weight was 75.00 ± 5.65 kg, and the mean body fat percentage was 14.12 ± 2.084 %. The mean age of the boxer experimental group was 23.87 ± 3.87 years, the mean training age was 11.37 ± 2.55 years, the mean height was 176.5 ± 4.92 cm, the mean body weight was 74.500 ± 6.86 kg, and the mean fat ratio was 14.19 ± 1.96 %.

Table 3: Post-test comparisons of CF and boxer experimental groups

Variables	N	Mean	SD	P
Bench Press (kg)	16	85.62	18.69	0.018
Squat (kg)	16	84.21	15.10	0.113
Bench Pull (kg)	16	76.09	11.40	0.011
Vertical Jump (cm)	16	53.68	5.44	0.172
Agility (sec)	16	11.98	1.15	0.001

A statistically significant difference was found in 1 MT Bench Press, Bench Pull and Hextagon agility test values ($p<0.05$). In 1 MT Squat and Vertical Jump test values, no statistically significant difference was found ($p>0.05$).

Table 4: Post-test comparisons of CF and boxer control groups

Variables	N	Mean	SD	P
Bench Press (kg)	16	87.18	19.64	0.011
Squat (kg)	16	80.15	15.04	0.916
Bench Pull (kg)	16	68.28	11.46	0.459
Vertical Jump (cm)	16	50.03	4.45	0.128
Agility (sec)	16	12.88	0.17	0.361

In the comparison of the post-test differences of boxing and KDS control groups, 1 MT bench press test was found significant ($p<0.05$). 1 MT Squat, Bench pull, Vertical Jump, Hextagon agility test values were not statistically significant ($p>0.05$).

Table 5: CF (Control and Experimental) Comparison of Differences

Variables	N	Mean	SD	P
Bench Press (kg)	16	85.62	18.69	0.018
Squat (kg)	16	84.21	15.10	0.113
Bench Pull (kg)	16	76.09	11.40	0.011
Vertical Jump (cm)	16	53.69	5.44	0.172
Agility (sec)	16	11.98	1.15	0.001

A statistically significant difference was found in 1 MT Bench Press, Bench Pull and Hextagon test values ($p<0.05$). In 1 MT Squat and Vertical Jump test values, no statistically significant difference was found ($p>0.05$).

Table 6: Boxer (Control and Experimental) Comparison of Differences

Variables	N	Mean	SD	P
Bench Press (kg)	16	93.28	10.82	0.633
Squat (kg)	16	85.46	13.88	0.81
Bench Pull (kg)	16	68.28	11.78	0.457
Vertical Jump (cm)	16	48.40	2.82	0.763
Agility (sec)	16	12.81	0.17	0.522

In the comparison of the post-test differences of boxing control and experimental groups, no significant difference was found in 1 MT Bench Press, Squat, Bench Pull, Vertical Jump, Anaerobic Power and Hextagon agility test values ($p>0.05$).

4. Conclusion and Discussion

4.1 CF Experimental Group

When the pre-test and post-test values of the branch-oriented quick strength training we applied in our research are compared in the CF experimental group, it shows that there is a statistically significant difference in 1 MT Bench Press, Squat, Bench Pull, and Vertical Jump values ($p<0.05$). These differences are thought to be caused by the quick strength training protocol applied in the study. No statistically significant difference was found in the Anaerobic Power test and Hextagon Agility test values ($p> 0.05$). It was thought that the body weight variables of the athletes were effective in the lack of improvement in the Anaerobic Power test. It was thought that the game plan of the athletes in technical training and matches may be effective in the lack of significant difference between the first and last test in Hextagon agility test values. Athletes who perform in matches according to their condition and technical capacities want to use their energy efficiently by moving less, and this less mobility can affect agility values.

4.2 CF Control Group

When the pre-test and post-test values of the CF control group were compared, a statistically significant difference was found in 1 MT Bench Pull, Anaerobic Power, and Hextagon Agility test values ($p<0.05$). It is thought that this difference is due to the variety of attacks and techniques in the CF branch. It is thought that wrestling exercises, which are included in technical training, improve the traction strength of the athletes. In 1 MT Bench Press, Squat, and Vertical Jump tests, no statistically significant difference was found ($p>0.05$). The lack of improvement in 1 MT Bench Press, Squat, and Vertical Jump tests in the control group shows that it is important to add strength training in addition to the technical training of the athletes. KDS athletes need to have high levels of endurance, strength, speed, anaerobic power and aerobic conditioning to use and combine different combat techniques (James et al. 2016). These high physical and technical demands emphasize the need for specific strength and conditioning training programs for these athletes (Rineu et al. 2016).

4.3 CF Experimental and Control Groups

A statistically significant difference was found in the 1 MT Bench Press, Bench Pull, Anaerobic Power and Hextagon test values in the comparison of the post-test differences of the experimental and control groups ($p<0.05$). These differences are thought to be caused by the quick strength training applied in the study. In 1 MT Squat and Vertical Jump test values, no statistically significant difference was found ($p>0.05$). It was thought that the fact that all control groups in the study participated in technical training and the kicking techniques included in the technical training of KF athletes in these trainings may

be the reason why there was no significant difference in 1 MT Squat and Vertical Jump values. KF can be defined as an intermittent sport with bursts of high speed and power activity (James et al. 2017). Therefore, CF is a physiologically complex sport in which a wide range of physical abilities (i.e., strength, power, speed, muscular endurance) and metabolic mechanisms (anaerobic and aerobic) are involved during training and competition (James et al. 2017). CF athletes need to have high levels of endurance, strength, speed, anaerobic power and aerobic conditioning to combine the use of different combat techniques (James et al. 2016). These high physical and technical demands emphasize the need for specific strength and conditioning training programs for these athletes (Rineu et al. 2016). Judo, jiu-jitsu and wrestling require athletes to have superior physical equipment. In order to maximize success in grappling and all weight sports, specific training is required to improve muscular strength and endurance, flexibility, speed, power, agility, balance and coordination, aerobic endurance and body fat reduction. Strength and conditioning training for grip strength consists of weight, plyometric, agility, flexibility, speed and aerobic training, appropriately periodized and integrated with sports practices to maximize performance at an appropriate time (Wozniak et al. 2006).

4.4 Boxer Experimental Group

When the pre-test and post-test values of the Boxer experimental group were compared in the quick strength training for the branch we applied in our research, a statistically significant difference was found in 1 MT Repeat Bench Press, Squat, Bench Pull, Vertical jump and Hextagon agility test values ($p<0.05$). These differences are thought to be due to the quick strength training applied in the study.

4.5 Boxer Control Group

When the pre-test and post-test values of the boxer control group were compared, no statistically significant difference was found in 1 MT Bench Press, Squat, Bench Pull, Hextagon Agility test values ($p<0.05$). Although the pre and post-test differences were statistically significant, mathematically, the difference in development in the experimental groups was higher than in the control group. Since the control groups participating in our research participated in technical and tactical training 3 days a week, it is thought to be effective in the development of the related parameters. No statistically significant difference was found in the vertical jump test ($p>0.05$).

4.6 Boxer Control and Experimental Groups

In the comparison of the post-test differences of the Boxer control and experimental groups, no statistically significant difference was found in 1 MT Bench Press Squat, Bench Pull, Vertical Jump, Anaerobic Power and Hextagon agility test values ($p>0.05$). Although there was no statistically significant difference between the experimental and control groups, it was seen that the development averages of the Boxer experimental group were higher than the control group. In mixed martial arts, a rapid application of force is required to deliver punches and kicks quickly to the opponent (Aagaard et al. 2002).

4.7 CF and Boxer Control Groups

A statistically significant difference was found in the 1 MT Bench Press test in the comparison of the post-test differences of the KF and Boxer Control groups ($p<0.05$). It is thought that the significant difference between the KF and Boxer control groups is due to the technical differences between the branches. While there are techniques and exercises from many different disciplines in the KF branch, there is a variety of techniques belonging to only one discipline in boxing. It is thought that these technical differences between the groups affect the strength development of the athletes. 1 MT Squat, Bench Pull, Vertical Jump, Anaerobic Power, and Hextagon agility test values were not statistically significantly different ($p>0.05$). 1 It is thought that the lack of improvement in 1RM Squat, Bench pull, Vertical Jump, Anaerobic Power, Hextagon agility test values is due to the lack of participation in quick strength training. Loannis et al. 2018, in a 4-week study on 17 competitive CF athletes, observed that a sport-specific low-volume, high-intensity strength and conditioning training program designed according to the demands of CF competitions significantly improved all speed, strength, power and aerobic performance parameters examined in trained CF athletes.

Strength, power and functional training, as well as sport-specific movements using light loads, have been proposed to increase the strength and speed of CF athletes (James et al. 2017). Maximal strength plays an important role in CF performance and especially in grappling (wrestling) actions, but it is also important for the development of high-speed qualities (James et al. 2017b, 2018). Grappling competitions are similar to wrestling competitions, and this similarity shows the importance of dynamic and isometric strength in these sports. In CF matches, 50% of the determined competitions end standing. The development of isometric and dynamic strength provides a decisive advantage for the CF athlete. It has been observed that there is a correlation between strength levels of athletes and power production (Kraemer et al. 2004). There are studies that have evaluated the effects of different strength training applied to boxers and CF athletes. Boxing tradition states that adding muscle mass to a boxer will slow them down. However, this is not true. A powerful punch depends on momentum. It is about how fast we can move the mass towards the target. This is why Boxers and CF athletes should train to get bigger, faster and stronger. Since boxing is a weight sport, athletes need to plan their hypertrophy training. In order for a boxer to produce the necessary speed and strength, they need to train to develop maximal and quick strength (Alan et al. 2016). In their study, Filimonov et al. analyzed the direct punches of 120 boxers, ranging from elite athletes to juniors. All boxers were instructed to perform the right jab as "fast and powerful" as possible. The results of this study showed that elite level boxers generate force predominantly from the leg muscles, while lower ranked boxers generate most of the force from the trunk and arms. Although it is thought that the difference between the groups is due to the different application of the technique, the research has shown the importance of strength for an effective punch (Flanagan 2008). Due to the large or very large correlation between strength-power measurements in the lower and upper extremities and the impact power produced/executed by elite amateur boxers when executing direct strikes, strength and conditioning coaches are advised to implement

specific training strategies and strength training. Such training has been shown to improve performance. Both upper and lower limbs have to be effective in applying high levels of force at high speeds in order to generate high levels of muscular strength. Accordingly, basic strength exercises such as Jump squat, Bench Press and Bench Throw, which utilize a range of loads that can increase power outputs to enhance the effectiveness of the techniques (Rineu et al. 2016). Our study supports Rineu et al. Our study supports the study of Rineu et al. Loturco, Irineu et al. In another study conducted on 12 elite-level boxers from the Brazilian Olympic Team, he observed a significant increase in Bench Press (+8%) and Jump Squat (+7%) exercises in a 7-week study based on the Optimum Power Load (OPL) system (Rineu et al. 2018). A short-term OPL training program (seven weeks) consisting of Bench Press and Jump Squat exercises performed two to three times a week was able to produce significant increases in power production in Olympic National Team boxers. Due to the strong relationships observed between Bench Press and Jump Squat strength measures and the punching effect, boxing coaches and practitioners have been strongly recommended to use the OPL training approach with professional athletes (Rineu et al. 2018**).**

Conflict of Interest Statement

The authors declare no conflicts of interest.

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References

Aagaard P, Simonsen EB, Andersen JL, Magnusson P, and Dyhre-Poulsen P. Increased rate of force development and neural drive of human skeletal muscle following resistance training. J Appl Physiol 1985 93: 1318–1326, 2002. https://doi.org/10.1152/japplphysiol.00283.2002

Alan N, Daniel C. Wilson Stephen W. Thompson Hembrought Strength and Conditioning for Professional Boxing: Recommendations for Physical Preparation Strength Cond J 2016, 82:38. http://dx.doi.org/10.1519/SSC.0000000000000217

Flanagan EP and Comyns TM. The use of contact time and the reactive strength index to optimise fast stretch-shortening cycle training. Strength Cond J 30: 33-38, 2008. http://dx.doi.org/10.1519/SSC.0b013e318187e25b

James L., Haff Robertson S., Beckman G., E., Kelly V. Identifying the performance physiological characteristics distinguishing successful mixed martial arts athletes: a characteristics of a winning outcome in elite mixed martial arts competition. Journal of science and medicine in sport 2017 20, 296-301. https://doi.org/10.1016/j.jsams.2016.08.001

James L.P., Haff G.G., Kelly V.G., Beckman E.M. Towards a determination of the systematic review of combat sport literature. Sports Medicine 2016 , 46, 1525-1551. https://doi.org/10.1007/s40279-016-0493-1

Hori N, Newton RU, Nosaka K, Stone MH. Weightlifting exercises enhance athletic performance that requires high-load speed strength. Strength Cond J , 2005 27:50-55. Retrieved from https://journals.lww.com/nsca-scj/abstract/2005/08000/weightlifting_exercises_enhance_athletic.8.aspx

Kraemer W, Vescovi J, and Dixon P. The physiological basis of wrestling: Implications for conditioning programs. Strength Cond J 26: 10–15, 2004. http://dx.doi.org/10.1519/00126548-200404000-00001

Lachlan P. James, Vincent G. Kelly, Emma M. Bechman. Periodization for Mixed Martial Arts, Strength and Conditioning Journal Volume 35 number 6-2013. Retrieved from https://journals.lww.com/nsca-scj/fulltext/2013/12000/periodization_for_mixed_martial_arts.6.aspx

Paul La Bounty, Bill I. Campbell, Matthew Cooke. Strength and Conditioning Considerations for Mixed Martial Arts. Strength And Conditioning Journal 2011:33(1). Retrieved from https://journals.lww.com/nsca-scj/fulltext/2011/02000/strength_and_conditioning_considerations_for_mixed.9.aspx

Rineu T, Nakamura Y, Artioli G. Strenght and Power Qualities Are Highly Associated With Punching Impact in Elite Amateur Boxer Journal of Strength and Conditioning 2016:30(1). https://doi.org/10.1519/jsc.0000000000001075

Sarı, Ö., & Tutar, M. (2025). Investigation of the Effects of 8-Week Tabata Training on Physical Performance in Amputee Football Players. Journal of Basic and Clinical Health Sciences, 9(1), 188-194. https://doi.org/10.30621/jbachs.1568553

Tamer K. Sporda Fiziksel-Fizyolojik Performansın Ölçülmesi ve Değerlendirilmesi, Bağırgan Yayınevi Ankara. 2000

Tutar, M., Bıyıklı, T., Ildem, C., & Ilhan, M. (2024). An Investigation of Some Motoric Characteristics Of National Elite Wrestling Athletes. Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health, 24(1). Retrieved from https://lida.sport-iat.de/dfb-fechten/Record/4086756

Wozniak E. H Kosmol A, Glaz A, Kusior A. The Eveluation of Upper LimbMuscles Anaerobic Performance of Elite Wrestlers and Boxers, Medsport press, 2006 12:2;218-221. Retrieved from https://publisherspanel.com/api/files/view/10551.pdf