Turkish Journal of Sport and Exercise
http://dergipark.gov.tr/tsed
Year: 2016 - Volume: 18 - Issue: 3 - Pages: 18-23

ISSN: 2147-5652

The effect of power trainings on maximal power and anaerobic power in boxer

Gamze OZDIL[1], Oktay CAKMAKCI[2]

[1] *School of Physical Education and Sports, Gaziantep University, Gaziantep, Turkey.*
[2] *Faculty of Sport Science, Selcuk University, Konya, Turkey.*
Address Correspondence to G. Ozdil, e-mail; gamzeozdil1990@gmaill.com

Abstract

The paper was done to analyze the effects of power trainings of different types as well as trainings performed for a 6-week competition period on maximal power and anaerobic power in the male boxers at an elite level. Within this study; 18 boxers aged between 19-25 who have actively engaged in the boxing branch, participated. Including the resistor group (LG) n:6, the dumbbell group (DG) n:6, the control group (CG) n:6, the three parts were included. The trial with resistance band and dumbbell mentioned was performed in the LG and DG groups between 9:00-10:00 a.m. for 5 days in a week during 6 weeks. Both trials were performed together doing boxing trainings aimed at competitions at 06:00 p.m. for 5 days in a week during 6 weeks. The control group did boxing trainings only aimed at competitions at 06:00 p.m. for 5 days in a week during 6 weeks. Their body weights, maximal power (bench press) and anaerobic power levels were measured with the Wingate test in all groups before a 6-week application, the same measurements were done after the application with resistance band and dumbbell as well as trainings in a 6-week competition period. When the findings were examined after the application with resistance band and dumbbell as well as a 6-week competition period trainings, there were not statistically significant differences in body weight (BW) levels between both in-group and between-group pre-tests and post-tests. When examining the anaerobic power and maximal bench parameters between the groups (LG, DG, CG), no significant differences were found in both pre-test comparisons and post-test comparisons. When looking at the pre-test and post-test variables in groups, there were statistically significant differences in the anaerobic power levels of the three groups (LG, DG, CG) ($P<0.05$). As the pre-test and post-test maximal bench levels were similar in the LG group, the maximal bench levels significantly increased in the DG and CG groups ($P<0.05$). As a result, it can be said that together with the period of competition with boxing training and resistance exercises do not provide a significant contribution for maximal strength and anaerobic force for boxers.

Keywords: Anaerobic power, boxing, force.

INTRODUCTION

Physical feasibility is required to show a great performance in sport. Having high efficiency in sportive performance is associated with appropriate physical and physiological structures peculiar to the sport field (9). Boxing sport is among the leading branches which require personal contact and body struggle with its performance style. This sport is one sport branch which is based on fighting two athletes who wear gloves peculiar to the branch when obeying with the rules of the branch (20). Boxing trainings are considered to provide anaerobic power, muscular strength and endurance, flexibility, hand and eye coordination, foot tricks, quickness and reflexive improvements (19). Trainings and performance developments in sport are continuously research topics and developing fields (11). Strength is a characteristic of explosive power occurring when making maximal efforts in a short period. These power and speed show themselves in activities like bouncing, launching and throwing (5). And in physiological approach, strength represents current tensions during muscular contractions (15).

Maximal power is the relevant utmost power when muscles contract slowly and intentionally. Based on maximal power trainings, all of neuromuscular units or at least most of them are related with exercises (10). Practice speed is possibly the highest strength overwhelmed with resistance without any ways. Maximal power underlies quick strength and sustainable strength (12). When an organism suffers from asphyxiation and in spite of this, it goes on working, working capacity is called anaerobic power (25). When we evaluate anaerobic power in terms of training science, it is deemed as a capability to do work and create energy in any

environment without oxygen under a high volume of burdens (17). This study aimed to analyze the effects of a 6-week competititon period and a resistance band training programme on maximal power and anaerobic power in boxers.

MATERIALS & METHOD

This study consisted of 18 male boxers as volunteer subjects who were aged between 19-25, had average height of 176.16 cm, studied at the Faculty of Sport Sciences in Selçuk University.

In this study, three groups including a band group (BG) n:6, a dumbell group (DG) n:6, a control group (CG) n:6 participated. Resistance band and dumbell trainings were applied in the subjects included in BG and DG groups between 9:00-10:00 a.m. for 5 days in a week during 6 weeks. The boxing training for the competition was performed at 06:00 p.m. As the trainings of control group for 6 weeks, competition-based boxing trainings were carried out at 06:00 p.m. for 6 days during the first 4 weeks and for 5 days during the last 2 weeks. Before a 6-week practice period, the subjects' height, weight, maximal power (bench press) were measured, also their anaerobic power levels were determined with the hand wingate test, the same measurements were repeated after resistance band and dumbell practice as well as a 6-week training programme of the competition period.

Their height and body weight were measured. Within the scope of Wingate Hand Anaerobic Power and Capacity Test, a Monark 824 model of hand biking ergometry with scales (Made in Sweden) which ran with a compatible software and was connected to a modified computer for Wingate test, was used here (16,25). Standard weights of 1-1,5-2-2,5-3-5-10-15-20 kg were utilised for the Bench press measurement in Maximal Power Estimation. Each subject's maximal power was determined with one repetition method, 1 Maximum Repetition (1MT) method was used (25). A set of eight repetition bench press movements was repeated by all the subjects having weight (kg) equivalent to 50% of their body weight before the test (kg) (2).

Statistical analysis; the SPSS 22.0 package programme was used in the statistical analysis of relevant data. Data was summarised with averages and standard deviations. Since data showed a normal distribution, the paired "t" test for the comparisons of pre-test and post-test in each group and the independent "t" test for the comparisons of groups with each other were performed. The significance level was regarded to be 0.05.

RESULTS

BW and Maximal bench pre-test and post-test values of BG group were similar. The change in Anaerobic Power pre-test and post-test levels was significant ($p<0.05$; Table 1).

BW pre-test and post-test values of DG group were similar. The change in Anaerobic Power and Maximal Bench (MBP) pre-test and post-test levels was significant ($p<0.05$; Table 2).

Table 1. Comparison of pre-test and post-test parameters in BG group (n = 6).

Parameters	Test	Mean ± SD	t	p
BW (kg)	Pre-test	76.27 ± 17.52	1.90	0.11
	Post-test	75.57 ± 16.68		
Anaerobic Power (W)	Pre-test	294.20 ± 112.67	-4.07	0.01*
	Post-test	367.16 ± 89.33		
Max Bench (kg)	Pre-test	72.83 ± 12.07	-1.70	0.15
	Post-test	75.00 ± 10.02		

BG: Resistance Band Group; * $p<0.05$

Table 2. Comparison of pre-test and post-test parameters in DG group (n= 6).

Parameters	Test	Mean ± SD	t	p
BW (kg)	Pre-test	75.83 ± 9.51	1.95	0.11
	Post-test	74.33 ± 8.54		
Anaerobic Power (W)	Pre-test	309.70 ± 49.58	-4.86	0.01*
	Post-test	349.50 ± 43.94		
Max. Bench (kg)	Pre-test	79.33 ± 7.87	-3.32	0.02*
	Post-test	82.00 ± 7.18		

DG: Dumbell Group; * $p<0.05$

Table 3. Comparison of pre-test and post-test parameters in CG group (n=6).

Parameters	Test	Mean ± SD	t	p
BW (kg)	Pre-test	74.48 ± 9.24	0.12	0.91
	Post-test	74.42 ± 10.37		
Anaerobic Power (W)	Pre-test	299.18 ± 31.64	-3.63	0.02*
	Post-test	346.67 ± 41.24		
Max. Bench (kg)	Pre-test	80.67 ± 6.65	-2.86	0.04*
	Post-test	84.33 ± 7.45		

CG: Control Group; * p<0.05

Table 4. Comparison of pre-test parameters in BG and DG groups (n=6).

Parameters	Group	Mean ± SD	t	p
BW (kg)	BG	76.27 ± 17.52	0.05	0.96
	DG	75.83 ± 9.51		
Anaerobic Power (W)	BG	294.20 ± 112.67	-0.31	0.76
	DG	309.70 ± 49.58		
Max. Bench (kg)	BG	72.83 ± 12.07	-1.11	0.30
	DG	79.33 ± 7.86		

BG: Band Group, DG: Dumbell Group; * p<0.05

Table 5. Comparison of post-test parameters in BG and DG groups.

Parameters	Group	Mean ± SD	t	p
BW (kg)	BG	75.57 ± 16.68	0.16	0.88
	DG	74.33 ± 8.54		
Anaerobic Power (W)	BG	367.16 ± 89.33	0.44	0.67
	DG	349.50 ± 43.94		
Max. Bench (kg)	BG	75.00 ± 10.02	-1.39	0.19
	DG	82.00 ± 7.18		

BG: Band Group. DG: Dumbell Group, * p<0.05

Table 6. Comparison of pre-test parameters in BG and CG groups.

Parameters	Group	Mean ± SD	t	p
BW (kg)	BG	76.27 ± 17.52	0.22	0.83
	CG	74.48 ± 9.24		
Anaerobic Power (W)	BG	294.20 ± 112.66	-0.10	0.92
	CG	299.17 ± 31.64		
Max. Bench (kg)	BG	72.83 ± 12.07	-1.39	0.19
	CG	80.67 ± 6.65		

BG: Band Group, CG: Control Group, * p<0.05

BW pre-test and post-test values of CG group were similar. The change in anaerobic power and maximal bench (MBP) pre-test and post-test levels was significant (p<0.05; Table 3).

There were not any significant differences between BW, anaerobic power and maximal bench (MBP) levels in pre-test of BG and DG groups (Table 4).

There were not any significant differences between BW, anaerobic power and maximal bench (MBP) levels in post-test of BG and DG groups (Table 5).

There were not any significant differences between BW, anaerobic power and maximal bench (MBP) levels in pre-test of BG and CG groups (Table 6).

Table 7. Comparison of post-test parameters in BG and CG groups.

Parameters	Group	Mean ± SD	t	p
BW (kg)	BG	75.57 ± 16.68	0.14	0.89
	CG	74.42 ± 10.37		
Anaerobic Power (W)	BG	367.16 ± 89.32	0.51	0.62
	CG	346.67 ± 41.24		
Max. Bench (kg)	BG	75.00 ± 10.02	-1.83	0.10
	CG	84.33 ± 7.45		

BG: Band Group. CG: Control Group, * p<0.05

Table 8. Comparison of pre-test parameters in DG and CG groups.

Parameters	Group	Mean ± SD	t	p
BW (kg)	BG	75.83 ± 9.51	0.25	0.81
	CG	74.48 ± 9.24		
Anaerobic Power (W)	BG	309.70 ± 49.58	0.44	0.67
	CG	299.18 ± 31.64		
Max. Bench (kg)	BG	79.33 ± 7.87	-0.32	0.76
	CG	80.67 ± 6.65		

BG: Band Group. CG: Control Group, * p<0.05

Table 9. Comparison of post-test parameters in DG and CG groups.

Parameters	Group	Mean ± SD	t	p
BW (kg)	DG	74.33±8.54	-0.02	0.99
	CG	74.42±10.37		
Anaerobic Power (W)	DG	349.50±43.94	0.12	0.91
	CG	346.67±41.24		
Max. Bench (kg)	DG	82.00±7.18	-0.55	0.59
	CG	84.33±7.45		

DG: Dumbell Group. CG: Control Group; * p<0.05

There were not any significant differences between BW, Anaerobic Power and Maximal Bench (MBP) levels in post-test of BG and CG groups (Table 7).

There were not any significant differences between BW, Anaerobic Power and Maximal Bench (MBP) levels in pre-test of DG and CG groups.

There were not any significant differences between BW, Anaerobic Power and Maximal Bench (MBP) levels in post-test of DG and CG groups.

DISCUSSION

Elastic bands have been used in various activities such as increasing old individuals' functional capacities, overcoming with chronic diseases and improving athletes' functional capacities, at rehabilitation centers following injuries today (27). Boxing is among fighting sports which require a high level of power, since it has a complex structure due to its highly dynamic and static features (14).

Within this study, BG's arm Wingate anaerobic power levels considerably increased at a significant level (p<0.05) with a 6-weekresistance band training programme. Also, significant increases (p<0.05) were observed in DG and CG. As a result of a 6-week boxing training programme regarding the relevant competition of three groups, there were significant (p<0.05) differences in their anaerobic power levels. But in addition to 6 weekly boxing trainings performed in BG and DG, extra trainings accompanied with resistance bands and dumbbells did not provide any additional increases in anaerobic power. Hence, Prieske et al. (18) divided 39 elite football players into two groups including experimental and control groups, while resistance band trials as well as normal season trainings were applied in the experimental group, the control group only kept on normal season trainings. As a result of a 9-week relevant plan, it was informed that strength, speed and shoot performances developed in both groups, and developments were similar in both of them, that resistance band trainings did not represent any differences. However, Kozub et al. (13) suggested that resistance band trainings made contributions to anaerobic power in wrestlers.

Similarly, Colado et al. (3) classified 42 female subjects, aged 21.79 years on average, performing physical activities, into three groups. The method

used in the band group (n:12), the free weight group (n:11) and the control group (n:13) was related with this study, all groups were subjected to 2-4 trainings in a week during 8 weeks, 3-4 sets and 8-15 repetitions at submaximal levels. By equalizing dumbbell and elastic band resistance in the study, these were applied for 5 days in a week at maximal and submaximal levels. This one was significantly similar to the method applied in our study. Colado et al. (3) carried out the same study angle by equalizing resistance bands and free weights. Finally, Colado et al. informed that they had significantly ($p<0.05$) strength developments in elastic band and free weight groups but these developments were same in both groups, this study nearly complies with our research findings.

A significant increase ($p<0.05$) was observed in the anaerobic power levels of BG and DG here. But similar increases between two groups showed that both method groups (band, dumbbell) were not reasons for being chosen in terms of the measured parameters. When similar studies were analyzed, Joy et al. 2013 (8) performed elastic band exercises in the experimental group as well as basketball trainings for 14 basketball players including 7 ones in the control group and 7 ones in the experimental group during 1 season, and suggested that there were no differences between two groups. Anderson et al. 2010 (1) studied the effects of resistance bands and dumbell works and stated that muscular activations increased in both researches depending on 5 different muscle groups but these increases did not differ in these relevant studies. However, Wallace et al. (25) researched on power development of 10 subjects aged 21.3 years on average and informed that ones using both free weight and elastic band had more power development rather than ones only using free weight.

Shoepe et al. (22) classified 20 weight-lifters into 2 groups including elastic band group and free weight group. By doing the bench press test with 1 RM method, power development was evaluated. After the training programme held for 3 days in a week during 24 weeks, both groups had power increases. But there were not any significant differences between both groups. Resistance band and free weight works provided increases at maximal bench levels of BG and DG but there was a significant increase ($p<0.05$) in DG rather than BG. Maximal bench level showed a significant ($p<0.05$) development in CG, which indicated that extra resistance band trainings did not have any effects on this parameter. Because a significant difference ($p<0.05$) was related that CG only did trainings during competitions. Ghigiarelli et al. (6) assessed the effects of a 7-week resistance band and free weight programme on upper extremity muscles with bench press test and maximal power in football players. A 4-day training programme in a week was applied in this research. Maximal power increased in both groups at a significant level but there were not any significant differences between both groups. On the other hand, Guex et al. (7) stated that maximal power developed in knee flexor as a result of elastic band exercises in 22 healthy individuals, Anderson et al. (1) also stated that flexible and changeable resistance training increased muscular performance, maximal efforts gave the utmost damage to muscles but they provided the ultimate power development when they researched the practice of free weight and resistance band in 32 female subjects. According to Gadruni et al. 2015 (4), power trainings with elastic bands caused muscle damage and deformation. Soria-Gila et al. (23) claimed that resistance band trainings had maximal power increasing effects when flexible resistance bands and power trainings were performed in athletes for the development of maximal power during 7 weeks.

Within this study, a 6-week training practice for boxing competitions gave rise to increases in arm wingate average anaerobic power (average power) of three groups (BG, DG, CG) at a significant level ($p<0.05$). This increase resulted from a 6-week training based on the competition period. Because there were not statistically significant differences between three groups (CG, DG, BG) in terms of the anaerobic power parameter. So it is clear that resistance band and free weight works with normal trainings did not make any significant contributions to the relevant parameter in the development of arm anaerobic power at least for boxers during the trainings of the competition period. Also, it is observed that when the maximal bench levels of the groups were examined in three groups (CG, DG, BG), there were increases but increases were significant ($p<0.05$) in DG and CG. A significant difference ($p<0.05$) in CG shows that the trainings of the competition period provided advances at maximal bench press levels, resistance efforts with these trainings did not make any contributions.

In conclusion, it can be addressed that resistance exercises accompanied by boxing trainings of the competition period in boxers did not

considerably contribute to maximal power and anaerobic power.

REFERENCES

1. Andersen LL, Andersen CH, Mortensen OS, Poulsen OM. Bjørnlund IB, Zebis MK. Muscle activation and perceived loading during rehabilitation exercises: comparison of dumbbells and elastic resistance. Physicaltherapy, 2010; 90(4), 538-549.
2. Bemben MG, McCalip G. Strength and power relationships as a function of age. J of Strength and Conditioning Research, 1999; 13(4): 330-338.
3. Colado JC, Garcia-Masso X, Pellicer M, Alakhdar Y, Benavent J, Cabeza-Ruiz R. A comparison of elastic tubing and isotonic resistance exercises. International Journal of Sports Medicine, 2010; 31(11): 810.
4. Gadruni K, Mahmmadpour H, Gadruni M, Effect of elastic-band exercise on muscle damage and inflammatory responses in Taekwondo athletes. Revista Brasileira de Medicinado Esporte, 2015; 21(4), 297-301.
5. Gallahue DL, Understanding Motor Development in Children. Wiley (NY), 1982; p. 415-435.
6. Ghigiarelli J, Nagle EF, Gross FL, Robertson RJ, Irrgang JJ, Myslinski T. Theeffects of a 7 week heavy elastic band and weight chain program on upper-body strength handupper-body power in a sample of division 1-AA football players. Journal Strength and Conditioning Research, 2009; 23: 756-764.
7. Guex K, Daucourt C, Borloz S, Validity and reliability of maximal-strength assessment of knee flexors and extensors using elastic bands. Journal of Sport Rehabilitation, 2015; 24(2).
8. Joy JM, Lowery RP, Oliveira de Souza E, Wilson JM, Elasticbands as a component of periodized resistance training. J StrengthCondRes, 2013.
9. Kalyon TA. Spor Hekimliği. Gata Basımevi. Ankara 1990.
10. Kanat ŞY. Üst Ekstremite Kas Grubuna Uygulanan Maksimal Kuvvet Antrenmanının Futbolda Taç Atışı Mesafesine Etkisi, Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, 2007.
11. Karatosun H. Antrenmanın Fizyolojik Temelleri Üçüncü Baskı, Altundağ Matbaası, Isparta, 2010.
12. Kılıç R. Dairesel Çabuk Kuvvet Antrenmanlarının 14–16 Yaş arası Güreşçilerin bazı Özelliklerine Etkisi, Yüksek Lisans Tezi, G.Ü. Sağ Bil Ens, Bed Egt ve Spor Ana Bilim Dalı, Ankara, 1992.
13. Kozub FM, Voorhis T, Using bands to create technique-specific resistance training for developing explosive power in wrestlers. Strength & Conditioning Journal, 2012; 34(5), 92-95.
14. Mitchell H, Willams L veReter BR Clasification of Sports Medicine and Science in Spots and Exercise. American College of Sports Medicine and the American College of Cardiology 1994.
15. Muratlı S, Kalyoncu O, Şahin G, Antrenman ve Müsabaka. Yaylım Yayıncılık, İstanbul, 2005; s.75, 109, 219-335.
16. Özkan A, Köklü Y, Ersöz G, Anaerobik Performans ve Ölçüm Yöntemleri, Gazi Kitabevi, Ankara 2010.
17. Pala R. Boks Milli Takımının Avrupa Şampiyonasına Hazırlık Kampları Süresince Bazı Fiziksel ve Oksidatif Stres Parametrelerinin İncelenmesi. Fırat Üniversitesi Sağlık Bilimler Enstitüsü Beden Eğitimi ve Spor Ana Bilim Dalı, 2011.
18. Prieske O, Muehlbauer T, Borde R, Gube M, Bruhn S, Behm DG, Granacher U, Neuromuscular and athletic performance following core strength training in elite youth soccer: Role of instability. Scandinavian Journal of Medicine & Science in Sports, 2016; 26(1), 48-56.
19. Quinna. Knockout Training Tips. United States Profession Tenis Registry. USA 1994.
20. Savaş İ. Spor Genel Kültürü. İnkılap Kitapevi. İstanbul 1997.
21. Shoepe T, Ramirez D, Rovetti R, Kohler D, Almstedt H. Theeffects of 24 weeks of resistance training with simultaneous elastic and free weight loading on muscular performance of novice lifters. Journal of Human Kinetics, 2011; 29: 93-106.
22. Shoepe T, Ramirez D, Rovetti R, Kohler D, Almstedt H. The effects of 24 weeks of resistance training with simultaneous elastic and free weight loading on muscular performance of novice lifters. Journal of human kinetics, 2011; 29, 93-106.
23. Soria-Gila MA, Chirosa IJ, Bautista IJ, Baena S, Chirosa LJ, Effects of Variable Resistance Training on Maximal Strength: A Meta-Analysis. The Journal of Strength & Conditioning Research, 2015; 29(11), 3260-3270.
24. Tamer K, Sporda Fiziksel – Fizyolojik Performansın Ölçülmesi ve Değerlendirilmesi, Türkerler Kitapevi, Ankara, 1995 4-158.
25. Wallace BJ, Winchester JB, McGuigan MR. Effects of elasticbands on forceandpowercharacteristicsduringthebacksquatexercise. Journal of Strength & Conditioning Research, 2006; 20(2), 268-272.
26. Willmore J, Costill D, Phisicology of Sport and Exercise, Humen Kinetics Pub, 1994; 233-447.
27. Yolcu SÖ. Direnç makinelerine karşın lastik bant antrenmanlarının puberte öncesi çocuklarda kassal kuvvete etkileri. Yüksek Lisans Tezi, Ege Üniversitesi Sağlık Bilimleri Enstitüsü, İzmir 2010.