

COMPARISON OF TURKISH NATIONAL KICKBOXERS ON MOTORIC PARAMETERS IN WEIGHT CATEGORIES AND PERFORMANCE LEVEL

ABSTRACT

This study examined some basic motoric features of elite Turkish kickboxers according to their weight categories (light, middle and heavy-weight) and sporting success. The study included 37 kickboxers in the camping period prior to the European Kickboxing Championship, and the participants were divided into three categories: Group A=Light-weight (60 kg and less, n=8); Group B=Middle-weight (between 61 and 74 kg, n=16); and Group C=Heavy-weight (75 kg and more, n=13). Participants were also divided into two groups: medalists (n=14; 22.07±3.17 years, 175.35±8.30cm, 68.92±15.77kg) and non-medalists athletes (n=23; 23.04±4.80 years, 179.96±7.09cm, 75.01±14.78kg). The participants completed a 20-meter sprint and tests of flexibility, handgrip strength, back and leg strength, balance and reaction. In conclusion, a significant difference was observed only in the parameters of absolute and relative strength between the weight categories, whereas no significant difference was found in the parameters of reaction, flexibility, balance and sprint. In addition, the basic motoric features of medalist athletes, which were different from others, were found to be relative strengths relative right hand grip strength (0.71±0.11, 0.63±0.08 kg), relative left hand grip strength (0.71±0.11, 0.63±0.08 kg), relative leg strength (1.86±0.39, 1.60±0.26 kg), relative back strength (1.98±0.52, 1.62±0.32 kg) and speed (2.82±0.26, 3.18±0.47 sec) p<0.05.

Key words: Elite kick boxers, weight categories, motoric parameters.

ÖZET

Bu çalışmada elit Türk Kickboksörlerin sıklıklarına göre bazı motorik özelliklerinin ve sportif başarılarının karşılaştırılması amaçlanmıştır. Çalışmaya Avrupa Şampiyonası hazırlık kampında olan 37 denek katılmıştır ve katılımcılar üç gruba ayrılmışlardır: Grup A=Light-weight (60kg ve daha az, n=8); Grup B=Middle-weight (61 ve 74kg arası, n=16); ve Grup C=Heavy-weight (75 kg ve üstü, n=13). Denekler ayrıca başarılarına göre madalya kazananlar (Avrupa ve dünya şampiyonalarında ilk üçe girenler), (n=14; 22.07±3.17yıl, 175.35±8.30cm, 68.92±15.77kg) ve madalya kazanamayanlar (ilk üçe giremeyenler), (n=23; 23.04±4.80 years, 179.96±7.09cm, 75.01±14.78kg) şeklinde iki gruba ayrılmışlardır. Deneklere 20m sprint, esneklik, pençe kuvveti, bacak, sırt kuvveti, denge ve reaksiyon testleri uygulanmıştır. Sonuç olarak, mutlak ve relatif kuvvette ağırlık kategorilerine göre karşılaştırıldığında farklılık olduğu tespit edilmiştir. Reaksiyon, esneklik, denge ve sprint performanslarında istatistiksel olarak bir farklılık bulunamamıştır. Madalya kazanan deneklerin relatif kuvvetleri değerlendirildiğinde sağ el (0.71±0.11, 0.63±0.08 kg) ve sol el (0.71±0.11, 0.63±0.08 kg), sırt(1.98±0.52, 1.62±0.32 kg) ve bacak (1.86±0.39, 1.60±0.26 kg) kuvvetlerinde ve sprint değerlerinde(2.82±0.26, 3.18±0.47 sn) farklılık olduğu görülmüştür.

Anahtar kelimeler:Elit kickboksörler, ağırlık kategorisi, motorik parametreler.

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INTRODUCTION

Combat sports are performed for self-defense, mental discipline and acquisition of physical condition. The determinant factors in these sports are technical and tactical skills, as well as motoric parameters like flexibility, balance, coordination, speed and skill. Kickboxing is a combat sport performed by combining fist, kick, knee and clinch moves. Kickboxing is increasing in popularity, and is promoted by many sport and fitness centers. It is practiced either for self-defence, general fitness or as a full-contact sport. Performance in kickboxing depends on athletes' physiological (3,25), biomechanical (14) and psychological characteristics (6).

Kickboxing training generally comprises 3 types. The first type involves callisthenic-basic training; kick and fist exercises. A large pad cushion is used in this part to minimize injury risk. The second type involves subsequent movements called kata (Japanese) or poomse (Korean) performed for balance, coordination and focus. In the third type, athletes spar for 2–3 minutes and this type of training indicates the highest level of training (9,15).

When kickboxing sport is examined in terms of basic motoric features, the main factor affecting the success of the athlete was found to be strength. For combat sports, strength means effective hitting and resisting against a rival. The other important factors are speed and coordination. The speed produced at the beginning and during a move is significantly important for combat sports. As speed and velocity increase, the decision-time for the rival will shorten and the probability of them making a tactical mistake will increase. In order to become effective in a short time, not only muscles but also neuromuscular coordination should be optimized (11). Athletes should

make quick attacks to win plays and, at the same time, should show quick reactions and prevent attacks by their rival. Therefore, athletes should have short movement times. In combat sports, experience is very important to the development of quick reactions. Experienced athletes evaluate visual data in the shortest time and use data on the probabilities of subsequent moves to predict the next movement and to make quicker and easier decisions (10).

In order to attain excellent technique as well as speed and quickness, other motoric features, such as flexibility, are also important (21). Achieving a score from an attacking or defensive move in combat sports depends mainly on the quickness of movement, joint mobility and reaction time (22). Insufficient muscle-flexibility hinders joint mobility, which limits the implementation of techniques in combat sports. Injuries are common in combat sports and flexibility is also effective in minimizing the injury risk (4).

Combat sports have spread worldwide from the Far-east (13), and have become very popular globally likewise in Turkey and Turkish athletes have achieved global success in kickboxing. The literature includes limited studies on kickboxing (4). Previous studies on combat sports are mainly focused on branches such as taekwondo, karate and judo [8,10,17,22]. Kickboxing belongs to group of polistructural acyclic sports. The result represent a binary variable with the purpose to avoid as many hits as possible with hands and (13), Kickboxers' motoric requirements vary according to weight (18). It is obvious that this sport requires specific motor abilities. It is interesting to explore how much influence motor abilities have on kickboxer's success in order to sufficiently adapt to weight. It is also interesting to see how and how much motor abilities influence the best result.

The motor abilities among different weight categories and performance level in kick boxing may show differences (13).

Therefore, this study was conducted to examine some motoric characteristics of Turkish kickboxers according to their weight-categories (light, middle and heavy) and sporting achievements.

MATERIAL AND METHODS

This study included 37 kickboxers who were in the camping period prior to the 2009 European Kickboxing Championship, 14 of whom were ranked top-three in the World and European Championships. All the subjects participated with their own will and signed an informed consent form detailing the study. The research was undertaken in compliance with the Helsinki declaration. The athletes were divided into three categories as: Group A, Light-weight (60 kg and less, n=8); Group B, Middle-weight (between 61 and 74 kg, n=16); and Group C, Heavy-weight (75 kg and more, n=13). Subjects were also divided into two groups, as medalists (n=14) and non-medalists (n=23) (Table 1). The measurements were conducted on all participants on the same day.

Sprint: A 20m sprint was timed using photocells (Newtest Powertimer, Finland) on a rubber surface and the best performance of two trials was recorded (seconds).

Flexibility: Using sit and reach flexibility table twice without bending knees in long sit position and the best score was recorded (cm).

Hand Grip Strength: Measurements were made by a handgrip dynamometer (Takei, Japan) adjusted to the dimension of the participant's hand. The best two of 4 trials of both hands were recorded (kg).

Back and Leg Strength: Measurements were made by a back and leg dynamometer (Takei, Japan) adjusted to

the standing position of the participant. The best one of 2 measurements was recorded (kg).

Balance: Balance measurement was made on balance board (Lafayette, USA), and the balance-time was recorded (sec).

Reaction Time: Reaction time was measured as a single-R test by a Newtest Powertimer reaction meter (Finland). The test was repeated 5 times against audible and visible signals and the averages were recorded as reaction time (ms).

Relative Strength: Strength measurements (hand grip strength, back strength, leg strength) were categorized according to body weights.

Analysis of the Data: Statistical analyses used SPSS (version 11.5). Descriptive statistics were expressed as mean \pm SD. The corresponding differences in different weight categories of Turkish kick boxing team with ANOVA were conducted and significance was determined at $p < 0.05$. The involved differences in medalist and non-medalist were evaluated by Wilcoxon matched pairs test, since the collected data was not normally distributed. $P < 0.05$ was considered statistically significant.

RESULTS

No statistically significant differences were found in visual and audible reaction, flexibility, balance, speed and relative back strength parameters between weight categories except the strength parameters (Table 2). In general, absolute and relative strength increases with weight. There is a significant difference exist in 20 meter sprint (2.82 ± 0.26 , 3.18 ± 0.47 sec), relative right hand grip strength (0.71 ± 0.11 , 0.63 ± 0.08 kg), relative left hand grip strength (0.71 ± 0.11 , 0.63 ± 0.08 kg), relative leg strength (1.86 ± 0.39 , 1.60 ± 0.26 kg), relative back strength (1.98 ± 0.52 , 1.62 ± 0.32 kg) between medalist and non-medalist respectively (Table 3).

Table 1. Some motoric parameters in different weight categories of Turkish kick boxing team.

	Light Weight A Group (n=8)	Middle Weight B Group (n=16)	Heavy weight C Group (n=13)	F Value	P value	ANOVA
Age (yrs)	19.75±2.81	22.06±2.9	25.23±5.03	5,556	,008	A-C**
Years of experience (yrs)	7.00±2.13	9.37±3.34	10.92±7.31	1,542	,229	NS
Body height (cm)	172.37±6.75	175.50±5.96	185.15±5.14	14,753	,000	A-C** B-C**
Body weight (kg)	56.65±3.07	67.05±5.79	89.53±11.34	63,930	,000	A-B* B-A* A-C** B-C**
Flexibility (cm)	31.81±11.62	41.49±8.54	36.82±9.27	2,865	,071	NS
Balance (sec)	20.93±5.06	20.46±3.43	17.46±2.01	3,494	,058	NS
20 m sprint (sec)	3.04±0.23	3.09±0.62	3.01±0.32	0,018	,982	NS
RHGS (kg)	41.23±4.41	47.16±4.73	50.85±5.69	9,044	,001	A-B* A-C**
RRHGS (kg)	0.72±0.08	0.71±0.07	0.58±0.09	11,710	,000	B-C** A-C**
LHGS (kg)	39.68±4.44	47.43±4.28	51.04±5.73	13,503	,000	A-B** A-C**
RLHGS (kg)	0.70±0.009	0.71±0.07	0.58±0.11	8,309	,001	A-C* B-C**
Leg strength (kg)	101.37±12.61	124.91±18.21	126.35±11.54	8,140	,001	A-B** A-C**
RLS (kg)	1.79±0.23	1.88±0.33	1.43±0.21	10,049	,000	A-C** B-C**
Back strenght (kg)	106.06±22.94	123.31±26.36	138.42±23.23	4,341	,021	A-C*
RBS (kg)	1.88±0.45	1.86±046	1.57±0.35	1,946	,158	NS
RHVRT (ms)	203.75±39.51	190.37±37.80	191.46±14.77	0,510	,605	NS
LHVRT (ms)	199.75±60.78	186.50±20.82	178.31±19.95	1,042	,364	NS
RHART (ms)	169.87±30.30	171.87±2806	173.31±62.86	0,041	,960	NS
LHART (ms)	181.12±36.53	183.37±27.86	159.62±30.74	2,362	,110	NS

*p<0,05 **p<0,01 NS: Non significant, RHGS: Right hand grip strength, RRHGS: Relative right hand grip strength, LHGS: Left hand grip strength, RLHGS: Relative right hand grip strength, RLS: Relative leg strength, RBS: Relative back strength RHVRT: Right hand visual reaction time, LHVRT: Left hand visual reaction time, RHART: Right hand audio reaction time, LHART: Left hand audio reaction time.

Table 2. Some motoric parameters in medalist and nonmedalist kickboxers of Turkish kick boxing team.

	Medallist (n=14)	Non Medallist (n=23)	F Value	P Value	t- Test
Age (yrs)	22,07±3,17	23.04±4,8	1,921	,506	0,672
Years of experience (yrs)	8,50±2,62	9,96±6,06	8,471	,321	1,007
Body height (cm)	175,36±8,30	179,96±7,09	0,136	,082	1,793
Body weight (kg)	68,91±15,78	75,00±14,79	0,491	,244	1,185
Flexibility (cm)	39,74±9,76	36,54±10,14	0,455	,352	0,942
Balance (sec)	20,50±3,75	18,91±3,61	0,473	,216	1,266
20 m sprint (sec)	2,82±0,26	3,18±0,47	3.031	,006	3,350**
RHGS (kg)	47,75±4,80	46,83±6,78	2,207	,660	0,443
RRHGS (kg)	0,71±0,11	0.63±0.08	0,719	,025	2,347*
LHGS (kg)	47,86±4,69	46,44±7,21	1,947	,517	0,655
RLHGS (kg)	0,71±0,11	0,63±0,09	0,083	,019	2,466*
Leg strength (kg)	124,04±15,17	118,06±19,14	1,143	,328	0,991
RLS (kg)	1,86±0,39	1,60±0,26	1,414	,020	2,446*
Back strength (kg)	130,78±19,49	121,30±30,24	3,117	,303	1,045
RBS (kg)	1,98±0,52	1,62±0,32	1,463	,016	2,542*
RHVRT (ms)	187,71±36,16	197,26±28,80	0,000	,381	0,888
LHVRT (ms)	187,93±22,77	185,61±38,52	0,730	,840	0,204
RHART (ms)	167,92±23,09	174,39±28,02	1,029	,473	0,725
LHART (ms)	177,00±19,45	173,04±37,99	3,555	,721	0,361

* $p < 0,05$ ** $p < 0,01$ NS: Non significant, **RHGS**: Right hand grip strength, **RRHGS**: Relative right hand grip strength, **LHGS**: Left hand grip strength, **RLHGS**: Relative right hand grip strength, **RLS**: Relative leg strength, **RBS**: Relative back strength **RHVRT**: Right hand visual reaction time, **LHVRT**: Left hand visual reaction time, **RHART**: Right hand audio reaction time, **LHART**: Left hand audio reaction time.

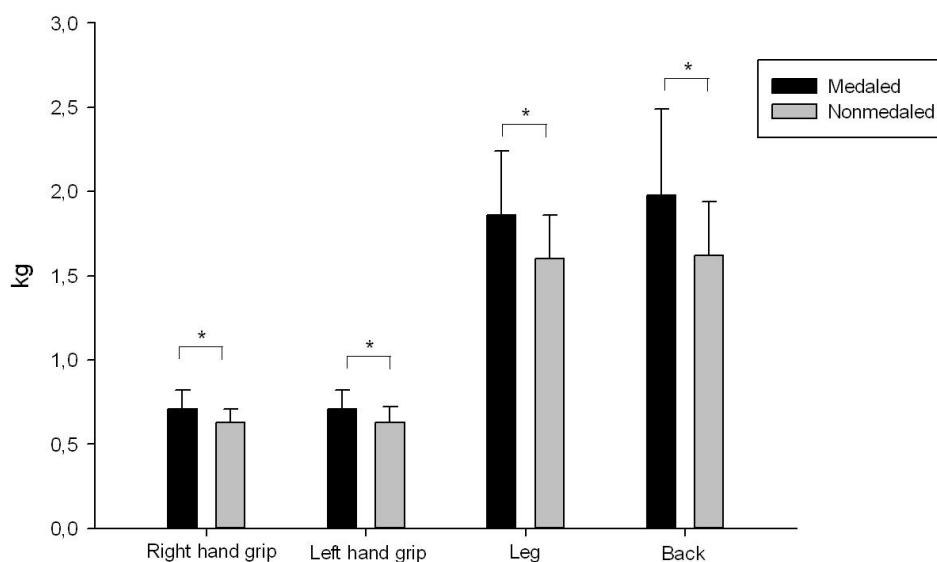


Figure 1. Relative strength values of medalist and non-medalist kickboxers.

DISCUSSION

Determining the physical and physiological characteristics of athletes according to weight categories is important in terms of prioritizing success and trainers and of scientific studies of combat sports (1). Some research is defined different weight categories require different physical, physiological and motoric abilities (20). In this study of the motoric characteristics of elite kickboxers according to their weight-categories, no statistically significant differences were found in reaction, flexibility, balance and speed parameters; or in reaction, flexibility, balance and strength parameters according to the evaluation of their success. However, significant differences were found in relative and absolute strength between weight-categories. In addition, significant differences were observed in speed and relative strength parameters according to medalist or non-medalist status in European and World Championships. In combat sports, speed, flexibility and reaction parameters should be improved to achieve a high level of technique and skill (22). When the values obtained from this study (flexibility, reaction, balance and strength) were compared with the other studies, similarities were observed between the subjects of this study and athletes from other combat sports (10,17). While there is a no significant difference in reaction, balance and flexibility parameters according to the weights and successes of athletes this can be explain by all the subjects being elite and national level competitive kickboxers. When strength parameters were examined, it was found that both relative strength and absolute strength were proportional to body weight and height. In morphological terms, the proportion of muscle mass to body weight is an important factor in muscle effectiveness

(7). Strength can never be evaluated as an absolute factor. The effect of strength on success in all sports is a well-known factor. The quality and amount of strength are of more importance in weight-classified sports. While evaluating the strength in sport, not only athletes body composition but also strength to weight ratio should also be considered (5,23). Baljinder and Kanyeovsky conducted two studies of weightlifting, a sport in which competitors are classified according to body weight, as in kickboxing. The findings showed that relative strength was directly proportional to body weight (2,12). The present findings for kickboxers are therefore consistent with those for weightlifters, reported in the literature. In this study, while the athletes showed differences in absolute and relative strength parameters according to weight categories, medalist and non-medalist showed significant difference according to relative strength and speed (Figure 1). This is the most interesting finding of the study and can be explained as relative strength and speed having positive effects on high performance. In previous studies on success in different combat sports, Marković et al. (16) divided 13 female taekwondo athletes into two categories according to their success (Olympiad, European, World Champ.). Subjects in Group A won at least 5 medals from these three contests in the previous five years and those in Group B did not win any medals from these contests. No inter-group difference was observed in absolute and relative strength parameters for bench press, bench press relative and back squat; however subjects in Group A were determined to have greater relative and absolute strength, especially in lower extremities. In a study of elite and non-elite judo athletes according to gender, age and weight categories, Franchini et al.

(8) found that strength was higher in lower extremities in elite athletes. Yoon (24) categorized wrestlers according to national and international success and found that those with international success had significantly greater upper-body strength. The differences found between successful and unsuccessful athletes in

these studies indicate that each sport branch displays some distinctive motoric characteristics. This present study determined that relative strength and speed are the most important characteristics for successful kickboxers.

CONCLUSIONS

While significant differences were found in absolute and relative strength parameters between weights categories of kickboxers, no significant difference was determined in reaction, flexibility, balance and speed parameters. On the other hand, basic motoric features of medalist athletes were found to be relative strength and speed,

which are distinctive to them. It is suggested that future studies may measure and evaluate motoric characteristics based on skill in order to determine detailed performance characteristics of kickboxers, and determine the performance criteria affecting competitive success.



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