Physical Characteristics of Elite Female Karate Athletes and Their Correlation with Visual Reaction Time

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Abstract: *Introduction*: Karate is a good example of a competitive sport with high levels of temporal and spatial constraints which require fast reactions. The purpose of this study is to assess the physical characteristics of elite competitive female karate athletes and their correlation with visual reaction time. *Methods*: Fourteen elite competitive female karate athletes (22.7 ± 3.07 years; 166.4 ± 7.8 cm of height; 58.1 ± 7.0 kg of body mass) volunteered to this study. They were outstanding athletes who had recently obtained prominence in state, national and international tournaments. 4*9m agility test was used for assessment of the agility of the athletes. For aerobic and anaerobic testing, the subjects were done the 1600m running and ergo jump tests, respectively. For fat assessment, bio-impedance analyzer (BIA) was used (Omron HBF-500). Lower limb muscular power and speed were assessed by vertical jump and 36m running test, respectively. Curl up was used to assess the abdominal muscular endurance. Visual reaction time was recorded by biofeedback system. The statistical analysis was carried out using the SPSS 16. The means and standard deviations were calculated for all the variables using descriptive statistics procedures. In the analysis and commenting the data; by using the pearson product moment correlation statistical technique, $P<0.05$ significance has been taken. *Results:* Results revealed that inFat percent (%body weight) for elite karate athletes was 20.9 ± 5.8. The correlation between agility and speed is equal 0.73 that is significant ($p=0.003$). No significant difference was found in the pearson correlation coefficient between different factors with visual reaction time. *Conclusion*: Ourresults provided good information for other researchers and coaches to use. The results of this study didn't show any significant correlation between some physical characteristics and visual reaction time that show other different factors could affect this variable.

Key words: Karate · Physical Profile · Reaction Time · Correlation

INTRODUCTION

Karate is a good example of a competitive sport with high levels of temporal and spatial constraints which require fast reactions. In sparring (kumite) and matches of karate, two athletes face each other within a 2-m distance, making offensive attacks against each other. The exceptional speed and power of offensive strikes demonstrated by expert karate athletes is well documented [1-4]. In addition, the karate requires stable joints, stances and karate cannot move as smoothly, quickly, or powerfully [5]. Its practice requires high technical skill accompanied by a great ability to perform strikes and

kicks as fast as possible [6, 7] and the practitioners are continuously challenged in performing very complex actions with precision and high velocity to adequately execute effective attack and defense techniques in combat [6, 8]. Therefore, the musculature involved in these actions needs to be quickly recruited in maximal effort, which highlights the importance of assessing physical characteristics such as muscular power, agility, aerobic and anaerobic capacity and body fat, Visual reaction time, muscular endurance and velocity in this population to compare with other countries athletes or with other sport athletes. Techniques and physical profiles of elite performers/ players can be used as a standard

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for evaluating technical performance and physical characteristics [9]. Therefore, the purpose of this study was to assess the physical characteristics of elite competitive female karate athletes and their correlation with visual reaction time. It was hypothesized that the specific sport adaptations related to the daily practice of this martial art would produce in these athletes.

MATERIALS AND METHODS

Subjects: Fourteenelitecompetitive female karate athletes (22.7 ± 3.07 years; 166.4± 7.8 cm of height; 58.1 ± 7.0 kg of body mass) volunteered to this study. They were outstanding athletes who had recently obtained prominence in state, national and international tournaments. Inclusion criteria for the study were: 18 to 29 years of age; black-belt degree (1st Dan or greater); current participation in organized competitions; and daily training frequency of at least 2 hours. Exclusion criteria were: previous injury or current instability in upper or lower limbs; regular participation in other sports activities; and presence of reported cardiovascular disease [8].

Procedures: Before all testing, the lower and upper limb muscles were warmed up for 10 minutes, this procedure was conducted exclusively with the purpose of avoiding muscle injuries during the assessments. 4*9m agility testwasused for assessment of the agility of the athletes. Foraerobic and anaerobic testing, the subjects were done the 1600m running and ergo jump tests, respectively. For fat assessment, bio-impedance analyzer (BIA) was used (Omron HBF-500). Subject age and gender were input to the Body's fat analyzers, as were height and weight which were measured independently. The BIA method uses a non-invasive technique to measure the subject's body fat and fat-free mass. The subjects were given instructions to undertake the measurement in a state of normal hydration (no exercise or alcohol/caffeine consumption in the preceding 12 h and no eating or drinking in the preceding 4-5 h). Lower limb muscular power and speed were assessed by vertical jump and 36m running test, respectively. Curl up was used to assess the abdominal muscular endurance. Visual reaction time was recorded by biofeedback system. During each series of tests the same examiner was verbally encouraging the subjects, in a standardized vigorous way, attempting to stimulate them to perform maximal effort. In the data collection, all assessments were considered and individually analyzed by a single examiner.

Statistical Analysis: The statistical analysis was carried out using the SPSS16. The means and standard deviations were calculated for all the variables using descriptive statistics procedures. In the analysis and commenting the data; by using the pearson product moment correlation statistical technique, $P<0.05$ significance has been taken.

RESULTS

Data from the 4*9m test and 36m running speed test is presented in Figure1. The correlation between agility and speed is equal 0.73 that is significant (p=0.003). Data from other physical profiles is presented in Table 1.

Pearson correlation coefficient between different physical characteristics with visual reaction time is presented in Table 2. No significant difference was found in the pearson correlation coefficient between different factors with visual reaction time ($P>0.05$).

DISCUSSION

Our objective was to assess Physical characteristics of elite female Karate athletes and their correlation with visual reaction time in order to recognize adaptations to regular training of this martial art and to identify these characteristics. Physical profiles showed in figure 1 and table 1 and these results provided good information for other researchers and coaches to use. Fat percent (%body weight) for elite karate athletes was 20.9±5.8. According tothe updated ACSM guidelines [10], exercise at an energy level of 300 kcal for a minimum of 3 days per week could lead to fat loss. Therefore, the authors concluded that around 30min of karate practice for 3 times per week might be appropriate for enhancing weight control and fat loss. Our results showed no significant correlation between abdominal muscular endurance, lower limb muscular power, aerobic capacity, agility and velocity with visual reaction time in elite karate athletes, just velocity showed a trend toward relationship with visual reaction time. Successful performance in sport requires not only efficient execution of motor behavior but also a high level of perceptual ability [11]. Karate is a good example of a competitive sport with high levels of temporal and spatial constraints which require fast reactions. Competitive high-level sports are characterized by severe spatial and temporal constraints imposed on the performer by regulations and the opponents [12]. Under such constraints, a player's ability to quickly and accurately perceive relevant information will facilitate
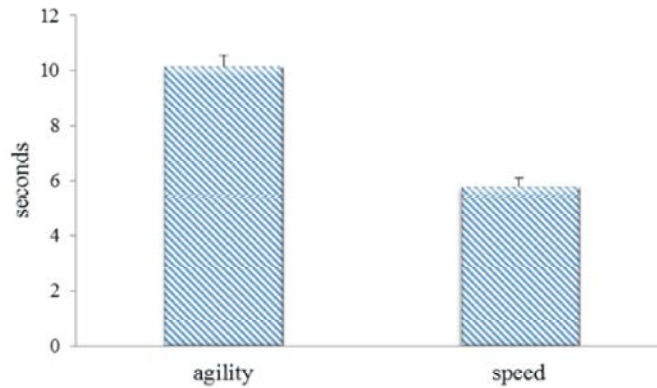
Fig. 1: Agility and speed running records (Mean±SD)

Table 1: Physical profiles of elite female Karate athletes

	Curl up	Vertical jump(cm)	1600m running(minutes)	Fat percent (%)	Ergo jump records	Visual reaction times(seconds)
Mean	65.5	45.2	7.9	20.9	34.6	0.495
SD	7.2	6.2	0.7	5.8	5.8	0.08

Table 2: Pearson correlation coefficient between different physical characteristics with visual reaction time

	Curl up	Ergo jump	Vertical jump	1600m running	Agility	Fat percent	Velocity
Visual reaction times	R=0.0	R=-0.02	R=-0.39	R=0.35	R=0.41	R=0.23	R=0.53
P value	1.0	0.92	0.16	0.21	0.15	0.41	0.051

decision making and allow more time for preparation and organization of motor behavior [13, 14]. Mori and *et al.* in 2004 showed significant differences between the karate athletes and the novices in the choice RT task, the difference being more marked for the video stimuli than for the dot stimuli. There was no significant difference in simple RT between the two groups of participants, for either type of stimuli. But the results of this study didn't show any significant correlation between some physical characteristics and visual reaction time that show other different factors could affect this variable. This study had several limitations that should be addressed. The relatively small sample of subjects may have affect in correlation results. This small sample was resultant of the difficulty in finding elite competitor karate athletes that would fit the inclusion criteria.

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