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The Comparison of Simple and Choice Reaction time in the Elite Karateka of Controlling, Semi-controlled and Free Styles

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ABSTRACT: Reaction time is one of the effective factors in sports; therefore the purpose of this study is to compare simple and choice reaction time in the elite karateka of controlling, semi-controlled and free styles of Alborz Province. The research is of causal-comparative type and 60 elite karateka of controlling, semi-controlled and free styles were selected by using convenience sampling and they were replaced in three groups. Data collection tools were the devices of measuring the reaction time of hand. For data analysis, analysis of variance and LSD post hoc tests were used at a significance level α<0/01.

The results show that the simple reaction time and choice reaction time in the elite karateka of controlling, semi-controlled and free styles are significantly lower. This matter attracts the attention of coaches of various styles of karate to the type of exercises performed in controlling style.

Keywords: simple reaction time, choice reaction time, controlling style, semi-controlled style and free style

INTRODUCTION

Among the various sports, karate is a good example of an athletic competition, with high levels of space - time limitations that require fast reaction (Mory, Ohtani and Imanaka, 2002) and karateka of different styles practice blasting techniques and saccadic movements that need quick response in order to gain success (Ravier, 2009). So fast processing of information and making decisions about what to do is one of the important and vital factors in the skilled performance of rapid movements and the reaction time as an indicator of the speed of decision making shows the speed of responsiveness of individual to stimuli (Schmidt and Lee 2005). In general, the time interval between stimuli presentation up to the commencement of the reaction is called the reaction time which has a variety of different situations. Such as when experimenter uses only one mark and only wants one answer (simple reaction time, SRT) or when the experimenter presents more than one sign that each sign requires a specific response (choice reaction time, CRT). Simple reaction time is very quick but with the addition of more possibility of answers, the delay of reaction time increases. According to Hick's Law with the increase in the number of possible choices, the reaction time increases logarithmically (Schmidt & Lee, 2005).

Many individual characteristics and environmental factors such as severity and type of stimulus, the level of excitation, physical activity and exercise, gender, and age are factors that influence reaction time (Kosinski, 2006) which have contained several studies. Among these factors, the factor of exercise has attracted more attention. Although most of us know that reaction time is influenced by genetics rather than the exercise, but athletes can improve the reaction time by exercises that lead to correct choices. So sport and exercise are one of the factors which affect the reaction time and the improvement of skill levels could decrease the reaction time. Several studies conducted in this area also prove this (Davranche, Burle, Audiffren, and Hasbroucq, 2006; Charu, Rini and Arun, 2008; Zwierko, Wielslaw and Damian, 2010; Van Biesen et al, 2010; Foroughi Pour *et al.*, 2013). Also the changes of reaction time under the exercises of various sports have been studied by some researchers. For example, De Quel *et al.*, (2008) showed the superiority of reaction time of fencers of the Spanish national team to karateka of Spanish national team or Foroughi Pour *et al.*, (2013) did not find any significant difference in reaction time of participants in tennis and volleyball trainings.

But some researches have also focused solely on examination of reaction time in karate, like Rasch *et al.*, (1963) who compared simple reaction time in experienced karateka of one style and came to the conclusion that there is no significant difference in simple reaction time of experienced karateka. Layton (1991) studied the reaction time for arm and leg kicks in karateka of Shotokan style and demonstrated that the reaction time for a fist kick in response to an auditory stimulus is much faster in professional karatake as compared to the amateur karateka. Also Layton (1993) by examining the speed of performing technique and age in karateka of Shotokan style concluded that there is no significant difference in reaction time of professional karateka for performing techniques. Kim et al (1998) compared the speed of visual perception in karateka with different skill levels and found that there are significant differences in perceptual judgments of professional karateka rather than karatake with lower levels of skill. Mori and colleagues (2002) in a study showed that there is a significant difference in choice reaction time of high level and low level karateka and high level karatake gain higher scores in their skills of predicting in accordance with target area in an attack to opponent.

De Brito and Silva (2011) by studying the reaction time of Portuguese karateka concluded that there are no significant differences in the simple reaction time among karateka with different skill levels, but the choice reaction time of expertise karateka was significantly more than low level karateka but their number of errors was less. Considering that the studies have shown that exercise and skill acquisition in sports can play role in improvement of the reaction time and since in none of the conducted researches the reaction time of elite karateka of different styles have not been compared with each other, in this study the researcher attempts to find the effects of different types of long-term exercise in a sport field on reaction time by comparing the reaction time of karateka of different styles of karate. Therefore the purpose of this study is to compare simple and choice reaction time in the elite karateka of controlling, semi-controlled and free styles of Alborz Province.

RESEARCH METHODOLOGY

The research is of causal-comparative type and 60 elite karateka of controlling, semi-controlled and free styles(20 karateka of controlling style, 20 karateka of semi-controlled style and 20 karateka of free style)with black belt Dan one and higher, who had been at least one time in the National team and they were selected by using convenience sampling. Data collection tools were the devices of measuring the reaction time of hand (manufactured by Iranian company of Satrap). The research method was in this way that the subjects put their hands on the buttons of the device that by the lighting of one of red, yellow and blue lights that were placed on the screen in front of the subjects, they pressed the button related to the lights and the lights were turned off and choice reaction time was recorded for the subject. In simple reaction time, only one button and one light were applied that by lighting of the light the subject pressed the related button until the light was turned off and choice reaction time was recorded for him. For data analysis, analysis of variance at a significance level of α <0/01 was used.

RESEARCH FINDINGS

Participants of the study were 60 elite karateka of three styles with an average age (22±5 karateka of controlling style, 20±4 karateka of semi-controlled style and 23±5 karateka of free style).

Table 1: Results of analysis of variance to assess mean differences between simple and choice reaction time in the studied groups.

Significance level	F	Mean of squares	Degree of Freedom	Sum of squares	
0/001	2631	877	2	1754	**SRT**
		0/33	58	2	**Groups**
			60	1756	**Sum**
0/001	1252	1252	2	2504	**CRT**
		1	2	6	**Groups**
			8	2510	**Sum**

Table 2: Results of LSD post hoc test to determine differences in mean.

Significance level	Mean difference	Comparison		
0/001	28	214 =Semi-controlled	186 =Controlling	**SRT**
0/001	31	217 =free	186 = Controlling	
0/001	3	217 =free	214 = Semi-controlled	
0/001	38	443 = Semi-controlled	405 = Controlling	**CRT**
0/001	32	437 =free	405 = Controlling	
0/001	6	437 =free	443 = Semi-controlled	

All scores are based on milliseconds.

Among the participants 6 karateka of controlling style, 9 karateka of semi-controlled style and 12 karateka of free style had the experience of being in national team more than three times and 7 karateka of controlling style, 6 karateka of semi-controlled style and 5 karateka of free style had the experience of being in national team for two times and 7 karateka of controlling style, 5 karateka of semi-controlled style and 3 karateka of free style had the experience of being in national team only once. According to the results shown in Table 1 and considering the significance level of the test error, there is significant difference between karateka of controlling, semi-controlled and free styles in the average of SRT and CRT. The mean differences between SRT and CRT in terms of the studied groups are given in Table 2.

According to results in Table 2, the mean of SRT in karateka of free style is more than karateka of controlling and semi-controlled style and the lowest mean of the SRT is related to controlling group. Also the mean of CRT in karateka of semi-controlled style is more than karateka of controlling and free style and the lowest mean of the CRT is related to controlling group.

DISCUSSION AND CONCLUSION

The results show that the simple reaction time and choice reaction time in the elite karateka of controlling, semi-controlled and free styles are significantly lower. In previous studies, researchers have found that elite karateka in comparison to amateur karateka have less simple and choice reaction time and higher levels of predictive power and speed of visual perception (Layton, 1991 and 1993, Kim et al, 1998; Mory, Ohtani and Imanaka, 2002), but in these studies there was no difference in RT of elite Karateka that they are inconsistent with the findings of this study. The subjects in this study are separately from elite Karateka of different styles, while in the previous studies the subjects usually were selected from a particular style and it is possible that different training programs in different styles of karate are difference factor of simple and choice reaction time in the elite karateka of this study. As the type and intensity of exercise have influence on physiological effects caused by the activity, psychological effects of activities also vary with the change of intensity and type of training (Naimikiya, 1385). Hence, it is possible that RT, which is a perceptual- motional factor, changes as a result of performing various exercises in long term. Considering the various styles of karate and that the controlling karate is a good example of an athletic competition, with high levels of space - time limitations that require fast reaction (Mory, Ohtani and Imanaka, 2002) and karateka of different styles practice blasting techniques and saccadic movements periodically (exercise and rest intervals) (Ravier, 2009). Thus, anaerobic metabolism is most important source of energy involved in these exercises (Imamura et al, 1999) that it is possible that the reason of high perceptual- motional abilities in karateka of different styles is the exercises with these metabolisms. Furthermore, based on specific learning theory, simulation of exercise condition with race condition is a principle of professional exercises (Schmidt & Lee, 2005), therefore the coaches of controlling styles of karate should apply the exercises in which the athlete is always involved in fast reactions (just like what happens in a controlled karate competition), this reflexive exercises, in long term will probably make the athlete more efficient at pre-motor reaction time which indicates the central processes involved in producing a response, such as forecasting and decision making. Also it can influence on motor stage of reaction time which indicates the muscular activity before the actual move. So athletes of controlling styles, who possibly perform reactional exercises, are forced repeatedly to predict and perform muscular activity, that in long time this will lead to correct choices and improvement of reaction time.

Finally, as should state that results of the this study are inconsistent with the findings of De Brito and Silva (2011) who have shown that athletes with more years of exercise and experience require more time to respond to stimuli, because in this study no comparison has been made between the beginner and elite karateka, but considering that the assumptions of study is that the elite karateka have better reaction time than the beginner karateka, the results of this study are inconsistent with the findings of De Brito. It should be noted that in the study of De Brito, the number of the errors of elite karateka were lower than the amateur karateka and in addition, the average age of the elite karateka in the study of De Brito was higher than the mean age of the karateka of our study. The reason of the high reaction time of karateka in the study of De Brito was their emphasis on the precision, which is justifiable according to the exchange low of the speed and accuracy that as the speed increases the speed decreases (Schmidt & Lee, 2005). The reaction time is also associated with age, which means that it increases during puberty and becomes highly changing and in young adults it gets improved and gradually gets slower with increasing of the age (Der and Deary, 2006). Considering that the success in controlling styles requires explosive reactions at the appropriate time, the coaches of this style should adjust their exercises in way that karateka require timely reactions during the exercises and due to the fact that the athlete is constantly involved in the process of preparation of motion and anticipation, this type of exercises in the long run will improve the reaction time of individual which attracts more attention of coaches and karateka of other styles to itself.

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