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COMPARISON OF SIMPLE VISUAL AND AUDIOTORY REACTION TIMES OF MARTIAL ARTS ATHLETES[i]

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Abstract:
Many fitness skills are required to be successful in martial arts sports. It is known that the reaction time is distinctive for performance in all martial arts, although the specific importance of different motoric features in sports branches is variable. The aim of this study is to compare simple visual and auditory reaction times of martial arts athletes. For this purpose, 48 male athletes between the ages of 15 and 25 who have been actively doing sports for at least 1 year in boxing, judo, karate, muay thai, kickboxing and taekwondo branches were voluntarily included in the study. Height, body weight, simple visual and auditory reaction time measurements were made by obtaining the age and year of starting sports of the athletes. There was no statistically significant difference between the visual and auditory reaction times according to the participants' age, body mass index and sports age variables ($p<0.05$). There was a statistically significant difference between the visual reaction times according to the success level variable of the participants, but no significant difference was found between the auditory reaction times ($p<0.05$). In terms of the sport branch variable of the participants, a statistically significant difference was found between the visual and auditory reaction times ($p<0.05$). Accordingly, it can be said that the visual reaction times of the athletes improve as the level of success increases, and the visual and auditory reaction times are more important in martial arts athletes (muay thai, karate taekwondo, kickboxing and boxing) where quickness, movement frequency and movement speed are important. As a result, it is thought that martial arts athletes who want to increase their level of success should include reaction time studies in their training programs. However, it is suggested that it would be beneficial to apply such studies to larger groups and to include women.

Keywords: martial arts athletes, visual reaction, auditory reaction

[i] This article is adapted from the thesis study entitled *Comparison of simple visual and auditory reaction times of martial arts athletes*.
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1. Introduction

Sports is a very important physical activity to increase the quality of life of people and as a result of these activities, people can be physically and mentally healthy (1). Regular exercise has the potential to improve human health and physical fitness (2). In addition, the exercise serves success in both provincial, national or international championships. The power of nations is now seen not only in terms of welfare, education, economic and military, but also in the form of sporting success (3).

When the historical process is examined, martial arts, which started in the struggle of man with nature from very ancient times, and emerged from wars and the struggle of man with his environment, over time turned into a sport with the element of competition and rules. Looking at the historical development of martial arts sports, it is seen that they emerged for similar reasons in different geographical regions and were shaped by regional characteristics (4).

Martial arts are activities that combine sports and artistic elements, are associated with the tradition of hand-to-hand combat, or are practiced unarmed, using specific tools whose main purpose is to protect oneself from physical attacks (5). Besides self-protection, it is also used for children's education, character development, physical fitness, mental strength, spirituality and achievement (6).

Some of the dominant physical components for martial arts athletes that must be continually trained are reaction, coordination, and speed. These three things are closely related to some techniques needed in martial arts namely kick technique, punch technique and defensive technique. A good response will benefit the athlete in attacking with both kicks and punches. Fast reaction time will produce a good reaction speed, especially to visual stimulus, it is very important to have a good reaction speed in martial arts, so it will benefit the athlete to score points (7).

Reaction time is a true indicator of a person's hand-eye coordination, reaction and alertness. Most of the work in sports and daily life is done using auditory and visual information. Reaction time is a measure of how quickly certain tasks are done (8). Athletes are known to have better reaction times than non-athletes. Reaction time is a determining factor affecting success in sports competitions. The reaction times of the athletes vary in different sports branches (8).

The main purpose of the trainings prepared by trainers, conditioners and sports psychologists for athletes; it is the achievement of great success in training and competitions by developing the conditional and mental characteristics of the athletes specific to the sport branch. New approaches and training programs are designed for athletes to achieve high performance in competitions (9).

It is thought that determining the reaction times of athletes in different branches in martial arts and knowing whether this is affected by various variables will contribute to the scientific literature. At the same time, it can be stated that knowing whether there is a difference between the reaction times of the athletes in different sports branches can contribute to the literature.

2. Material and Method

The research is a scanning design and aimed to compare the simple visual and auditory reaction times of martial arts athletes. Forty-eight male athletes residing in Gaziantep, between the ages of 15 and 25, who have been actively doing sports in the branches of boxing, judo, karate, muay thai, kick boxing and taekwondo for at least 1 year, were voluntarily included.

2.1 Collection of Data

Height, body weight, simple visual and auditory reaction time measurements were made by obtaining the age and year of starting sports of the athletes. Specially developed software for the visual and auditory reaction times of the athletes were applied using the online environment (www.humanbenchmark.com, www.cognitivefun.net). The environment for the test was arranged by minimizing external influences. The application of the test was explained to the athletes. Afterwards, the athletes were allowed to get used to the test by applying the test. The test was started as soon as the athletes felt ready. Five trials were made for the visual and auditory reaction times of the athletes and their arithmetic average was taken (10-12).

2.2 Statistical Analysis

SPSS22 package program was used in the analysis of the data sets. Shapiro Wilk test was used to test the normality assumptions of the data sets. After the normality assumption was made, the mean and standard deviation values of the data were given. Pearson Correlation test was applied to test the relationship of the data sets with each other. In addition, the One Way Anova test was applied to understand whether there was a significant difference between the groups, and the LSD test, one of the Post Hoc tests, was used to understand between which seasons the significant difference was (13).

3. Results

Table 1: Descriptive Parameters of Participants

Sport branches	N	Height (cm)	Weight (kg)	BMI	Sport age	Degree of Success
		Mean. ± S.D.	Mean. ± S.D.	Mean. ± S.D.	Mean. ± S.D.	Mean. ± S.D.
Judo	8	1,75 ± 0,06	66,88 ± 0,44	21,54 ± 4,16	2,62 ± 0,74	4,75 ± 070
Karate		1,72 ± ,09	68,38 ± 16,68	22,82 ± 3,22	4,38 ± 1,30	3,00 ± 1,41
Muay thai		1,76 ± 0,06	71,00 ± 11,90	22,66 ± 3,04	2,50 ± 1,85	4,13 ± 1,80
Kick box		1,73 ± 0,07	62,50 ± 15,73	20,53 ± 4,31	1,38 ± 0,51	5,25 ± 1,03
Taekwondo		1,79 ± 0,06	65,63 ± 11,99	20,30 ± 2,99	4,13 ± 1,55	3,25 ± 1,58
Boxing		1,74 ± 0,06	68,25 ± 11,99	22,52 ± 2,53	1,50 ± 0,53	4,88 ± 1,35

When Table 1 is examined, the athletes in the branch of judo; mean height 1.75 ± 0.06, mean body weight 66.88 ± 0.44, mean body mass index 21.54 ± 4.16, mean age in sports 2.62 ± 0.74, mean achievement score 4, It was determined as 75 ± 070. Athletes in karate branch; mean height 1.72 ± 09, mean body weight 68.38 ± 16.68, mean body mass index

22.82 ± 3.22, mean age in sports 2.50 ± 1.85, mean achievement score 3.00 ± It was determined as 1.41. Athletes in the muay thai branch; mean height is 1.76 ± 0.06, mean body weight is 71.00 ± 11.90, mean body mass index is 22.66 ± 3.04, mean age in sports is 2.50 ± 1.85, mean achievement score is 4. It was determined as 13 ± 1.80. Athletes in the Kickboxing branch; mean height 1.73 ± 0.07, mean body weight 62.50 ± 15.73, mean body mass index 20.53 ± 4.31, mean age in sports 1.38 ± 0.51, mean score of success 5, It was determined as 25 ± 1.03. Athletes in Taekwondo branch; mean height 1.79 ± 0.06, mean body weight 65.63 ± 11.99, mean body mass index 20.30 ± 2.99, mean age in sports 4.13 ± 1.55, mean score of success 3, It was determined as 25 ± 1.58. Athletes in the boxing branch; mean height is 1.74 ± 0.06, mean body weight is 68.25 ± 11.99, mean body mass index is 22.52 ± 2.53, mean age in sports is 1.50 ± 0.53, mean achievement score is 4. It was determined as 88 ± 1.35.

Table 2: Comparison of the visual and auditory reaction times of the athletes according to the age variable (Oneway Anova Test)

		N	Mean.	Std. Dev.	p	Difference
VRT	15-18 age	35	246,63	23,309	0,277	-
	19-22 age	10	242,60	19,772		
	23 age and above	3	225,33	6,028		
ART	15-18 age	35	225,69	24,868	0,055	-
	19-22 age	10	244,70	44,111		
	23 age and above	3	200,00	6,083		

VRT: Visual Reaction Time, ART: Auditory Reaction Time

When Table 2 is examined, no statistically significant difference was found between the groups in terms of the age variable of martial arts athletes ($p<0.05$).

Table 3: Comparison of visual and auditory reaction times of athletes according to body mass index variable (Oneway Anova Test)

		N	Mean	Std. Dev.	p	Difference
VRT	Weak	11	246,91	16,053	0,152	-
	Normal weight	27	247,96	25,334		
	Fat	10	232,30	15,706		
ART	Weak	11	226,64	26,020	0,225	-
	Normal weight	27	233,74	33,282		
	Fat	10	214,20	24,845		

When Table 3 was examined, no statistically significant difference was found between the groups in terms of body mass index variable of martial arts athletes ($p<0.05$).

Table 4: Comparison of visual and auditory reaction times of athletes according to sports branch variable (Oneway Anova Test)

		N	Mean	Std. Dev.	p	Difference
VRT	Judo (1)	8	267,13	15,160	**0,001**	1-2, 1-3, 1-5, 1-6, 2-3, 2-4, 4-6
	Karate (2)		225,75	10,593		
	Muay thai (3)		245,50	27,423		
	Kick box (4)		253,75	11,696		
	Taekwondo (5)		243,25	20,790		
	Boxing (6)		231,38	19,741		
ART	Judo (1)		256,38	37,348	**0,005**	1-2, 1-4, 1-6, 2-3, 2-5, 5-6
	Karate (2)		206,88	14,942		
	Muay thai (3)		229,75	31,404		
	Kick box (4)		223,38	14,192		
	Taekwondo (5)		241,63	34,268		
	Boxing (6)		210,25	16,334		

When Table 4 is examined, a statistically significant difference was found between the 1-2, 1-3, 1-5, 1-6, 2-3, 2-4 and 4-6 groups in the visual reaction time averages of the athletes according to the sport branch variable. On the other hand, no statistically significant difference was found in the visual reaction time averages between the other groups. A statistically significant difference was found between the 1-2, 1-4, 1-6, 2-3, 2-5 and 5-6 groups in the mean auditory reaction times ($p<0.05$). On the other hand, no statistically significant difference was found in the mean auditory reaction times between the other groups ($p<0.05$).

Table 5: Comparison of visual and auditory reaction times of athletes according to sports age variable (Oneway Anova Test)

		N	Mean	Std. Dev.	p	Difference
VRT	0-2 years	13	247,31	16,271	0,503	-
	3-4 years	12	248,00	24,506		
	5-6 years	11	247,36	26,277		
	7-8 years	3	245,00	27,514		
	9-10 years	4	238,75	30,923		
	11 years and above	5	226,40	6,693		
ART	0-2 years	13	219,62	19,372	0,102	-
	3-4 years	12	228,67	24,677		
	5-6 years	11	240,09	32,089		
	7-8 years	3	260,67	70,515		
	9-10 years	4	224,50	23,558		
	11 years and above	5	205,20	24,773		

When Table 5 was examined, no statistically significant difference was found between the groups according to the sports age variable ($p<0.05$).

Table 6: Comparison of the visual and auditory reaction times of the athletes according to the success level variable (Oneway Anova Test)

Variable		N	Mean.	Std. Dev.	p	Difference
VRT	World or European Championship Rating (1)	2	239,50	6,36	**0,002**	2-4, 2-5, 2-6, 3-4, 3-5, 3-6
	International Championship Rank (2)	7	226,14	6,28		
	National Championship Rating (3)	5	218,40	10,26		
	Regional Degree (4)	13	256,31	22,59		
	Provincial Rank (5)	7	249,57	29,99		
	No Degree (6)	14	250,07	14,91		
ART	World or European Championship Rating (1)	2	239,00	9,89	0,251	
	International Championship Rank (2)	7	209,29	12,72		
	National Championship Rating (3)	5	222,60	32,16		
	Regional Degree (4)	13	235,46	34,563		
	Provincial Rank (5)	7	245,57	48,62		
	No Degree (6)	14	222,14	17,56		

When Table 6 is examined, a statistically significant difference was found between the 2-4, 2-5, 2-6, 3-4, 3-5 and 3-6 groups in the visual reaction time averages of the athletes according to the variable of success degree. On the other hand, no statistically significant difference was found in the visual reaction time averages between the other groups. No statistically significant difference was found in the auditory reaction time averages ($p<0.05$).

4. Discussion

In this part of the study, the findings obtained are summarized and discussed in comparison with similar studies in the literature, and evaluations, opinions and suggestions about the results are given.

No statistically significant difference was found between the reaction times of the athletes in terms of age, body mass index and sports age variables ($p<0.05$).

According to the branch variable of the athletes, a significant difference was found between judokas and karate players in favor of karate players, between judokas and muaythaicians in favor of combatants, between judokas and kickboxers in favor of kickboxers, between judokas and taekwondoers in favor of taekwondo players, and between judokas and boxers in favor of boxers. On the other hand, a significant difference was found between karate players and fighter in favor of mauaithaists, between karate and kickboxers in favor of kickboxers, and between kickboxers and boxers in favor of boxers ($p<0.05$). Similarly, in the auditory reaction times of the athletes according to the branch variable, statistically, statistically, between judoka and karate players in favor of karate, between judoka and kickboxers in favor of kickboxers, between judoka and boxers in favor of boxers, between karate players and taekwonists in favor of taekwonists, between karate players and taekwonists in favor of taekwonists. A significant difference was found in terms of ($p<0.05$).

According to the success level variable of the athletes, a significant difference was found between the visual reaction times of those with international degrees, those with regional and provincial degrees, or those with no degrees in favor of those with international degrees ($p<0.05$). On the other hand, no statistically significant difference was found between auditory reaction times ($p<0.05$).

Erbaş and Çakır (2021), in their study comparing various parameters of elite and non-elite taekwondo athletes, reported that there was no statistically significant difference between the visual reaction times of elite and non-elite taekwondo athletes (14). In our study, it was observed that the visual reaction time improved as the level of success increased. There are many different methods for measuring visual reaction time. While measuring the visual reaction time, the environmental conditions must be regulated very well and completely free from the elements that may adversely affect the results (15). Considering the necessity of reacting to instant position and movement changes of the opponent in branches such as taekwondo, kickboxing, boxing, muay thai and karate, it is thought that the visual reaction times of the elite level athletes should be better (16). Therefore, it is thought that the lack of difference in visual reaction times between elite and non-elite athletes in the related study may be due to the measurement method.

Donovan et al. (2006) stated that the reaction times of martial arts athletes differed significantly when compared to sedentary ones in their study evaluating the leg strength and reaction times in martial arts athletes (17). In our study, it was observed that the reaction time improved as the level of success increased. Our findings overlap with this study and are supported by the findings of this study.

Atan and Akyol (2014), in their study comparing the reaction times of the athletes in different sports branches, reported that the reaction times of the athletes in other branches, except for the judo branch, did not differ (18). The findings of our study are also consistent with these findings. It can be said that this is due to the fact that Judo branch is mostly based on physical strength and technique, whereas other martial arts are based on quickness (19).

Polat et al. (2018), in their study comparing the visual and auditory reaction times of elite taekwondo and kickboxers, reported that there was no significant difference between the visual reaction times of the athletes, however, the auditory reaction times of the taekwondo athletes were better than the kickboxers (20). In our study, no statistically significant difference was found between the visual and auditory reaction times of taekwondo and kickboxing athletes. It is thought that this situation is due to the fact that the relevant study covers elite athletes. In addition, it is thought that visual and auditory reaction times may also be due to measurement methods.

As a result, it can be said that as the success level of martial arts athletes increases, their visual and auditory reaction times improve, and when compared to judo, reaction time has a more important place in sports branches such as muay thai, karate, taekwondo, kickboxing and boxing. It is thought that the inclusion of reaction exercises by martial arts athletes in their training may contribute to more successful results. It is thought that

the application of similar studies to different age, gender and level groups may contribute to the scientific literature.

It can be said that studies to investigate the effect of different trainings aimed at improving reaction speed on improving reaction speed can also contribute to the scientific literature. In addition to this, it is thought that researches to examine the effects of different reaction speed trainings on athletes in different age groups, different genders and different branches may contribute to the scientific literature.

Conflict of Interest Statement

There are no potential conflicts of interest on this article.

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