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Investigation of Visual and Auditory Reaction Times of Elite and Non-Elite Field Hockey Athletes

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Abstract

The aim of this study is to examine the visual and auditory reaction times of elite and non-elite hockey players. Between the ages of 19-29 33 elite male hockey players who selected to U21 national team of Türkiye and 37 non-elite hockey players who playing in the hockey super league and 1. league as a volunteer in the study. In the laboratory where age, height, body weight measurements and appropriate environmental and environmental conditions are provided to the groups. Firstly, the auditory reaction test was applied to the athletes, and then the visual reaction test was applied. Measurements were applied with online computerized programs (for visual reaction, www.humanbenchmark.com; for auditory reaction, www.cognitivefun.net).When statistical analysis of data is done; A significant difference was found in favor of non-elite athletes in the visual reaction test ($p<0.05$). In the auditory reaction test, a significant difference was found in favor of elite athletes ($p<0.05$). Consequently, a significant difference in favor of non-elite athletes in the visual reaction time test indicate that visual reaction time of non-elite athletes is better than elite athletes. a significant difference in favor of elite athletes in the auditory reaction time test indicate that auditory reaction time of elite athletes is better than non-elite athletes. In addition, it was concluded that the auditory reaction times of the elite and non-elite hockey players were better than the visual reaction times.
Keywords: Sport, Performance, Training, Exercise

Elit Olan Hokey Sporcuları ile Elit Olmayan Hokeyi Sporcularının Görsel ve İşitsel Reaksiyon Zamanlarının İncelenmesi

Öz

Bu çalışmanın amacı; elit hokey sporcuları ile elit olmayan hokey sporcularının, görsel ve işitsel reaksiyon zamanlarının incelenmesidir. Çalışmaya 19-29 yaşları arasında Türkiye Hokey Federasyonu U21 takımına seçilen elit 33 hokey sporcusu ve 2022-2023 sezonu süper lig ve 1. ligde oynayan, elit olmayan 37 erkek hokey oyuncusu gönüllü olarak katılmıştır. Gruplara yaş, boy, vücut ağırlığı ölçümleri ve uygun ortam ve çevre koşullarının sağlandığı laboratuvarda ilk olarak işitsel reaksiyon testi uygulanmış daha sonra görsel reaksiyon testi uygulanmıştır. Ölçümler de online bilgisayar programları (görsel reaksiyon testinde www.humanbenchmark.com; işitsel reaksiyon testinde www.cognitivefun.net) kullanılmıştır. Verilerin istatistiksel analizi yapıldığında; Görsel reaksiyon testinde elit olmayan hokey sporcular lehine anlamlı fark bulundu ($p<0.05$). İşitsel reaksiyon testinde ise elit olan hokey sporcuları lehine anlamlı fark bulundu ($p<0.05$). Sonuç olarak; görsel reaksiyon testinde, elit olmayan hokey sporcuları lehine anlamlı farklılık bulunması görsel tepki sürelerinin elit hokey sporcularına göre daha iyi olduğunu göstermektedir. İşitsel reaksiyon testinde; elit hokey sporcuları lehine anlamlı farklılık bulunması işitsel tepki sürelerinin elit olmayan hokey sporcularına göre daha iyi olduğunu göstermektedir. Ayrıca elit olan ve elit olmayan hokey sporcularının işitsel tepki sürelerinin görsel tepki sürelerine göre daha iyi olduğu sonucuna varılmıştır.
Anahtar kelimeler: Spor, Performans, Antrenman, Egzersiz

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INTRODUCTION

Achieving permanent success in sports is about using scientific methods effectively. It is aimed to increase the mental and physical performance of the athlete with the training programs prepared on the basis of scientific foundations. It is obvious that scientific and especially technological developments make their presence felt in every aspect of our lives and are now an indispensable element in the field of sports. One of the important parameters for athlete performance, which has recently been the subject of exercise and sports sciences, is reaction time (Avci, 2021).

Reaction is the process of individuals perceiving this stimulus after a stimulus is given, transmitting the perceived stimulus to the brain via the central nervous system, and transmitting the response to the muscles again by the central nervous system, coordinating the stimulated muscles according to the response and initiating the movement (Hall, 2020).

Reaction time shows neuromuscular coordination situation and condition (Jose & Gideon, 2010). Reaction time, it is an inherited feature that determines the time between a person's first muscular reaction or movement to stimuli (Bayar & Koruç, 1992; Thompson et al., 1992). It has been reported that the ART (auditory reaction time) of young adults is faster than the VRT (visual reaction time), the auditory and visual reaction times of male young adults are faster than female young adults, and the auditory and visual reaction times of young adults who exercise regularly are faster than young adults who do not exercise (Cerrah et al., 2010; Owais et al., 2019).

It is known that, in normal situation, athletes have better reaction performance from non-athletes (Hascelik et al., 1989; Moka et al., 1992). In a study examining the visual and auditory reaction times of university students who play team sports (Basketball, Football, Volleyball, Handball, Cricket) and university students who do not do sports, it was observed that the VRT and ART of students who are athletes are faster than students who are not athletes (Hamidur, 2021). It has been determined that reaction time, which is an important parameter in determining performance in many sports branches, can be improved with training as a result of studies (Cerrah et al., 2010). Reaction time is great importance in sports where a participant's movements are determined by signals, opponents' movements or ball movements (Gavkare et al., 2010; Yüksel & Tunç, 2018). In this regard, the reaction time; It is one of the basic parameters of the hockey branch, which is played with a heavier vehicle compared to the movements of the ball and racquet sports (Reilly & Borrie, 1992).

It has been determined that reaction time, which is an important parameter in determining performance in many sports branches, can be improved with training as a result of studies (Cerrah et al., 2010). Based on this information, many scientific studies have been conducted in recent years investigating visual and auditory reaction performance. Reaction times have been the subject of research because they have an important place in performance, especially in sports such as football, basketball, volleyball and athletics, as well as in sports such as canoeing, taekwondo and karate.

Hockey includes all the elements of physical fitness. The feature that offense and defense need in hockey is to be fast in short and long distances. Hockey, which gives the opportunity to use its physical and mental features in the best way, has a wide technique and finesse in its construction, provides regulation on the nervous system, especially improves the coordination of the senses of sight and hand-touch (eye-muscle coordination), enabling the muscles to act quickly and to be repeated easily when necessary. It is a sport in which quickness, quick strength and reaction time are priority (Auxter et al., 1993; Enzo, 2016). In the literature, studies have been carried out in many branches in individual and team sports,

and the importance of reaction time for athlete performance has been revealed as a result of these studies. However, no similar study was found on hockey players. At these points, it can be concluded that our study is important. The present study intention to compare the reaction times of elite hockey players and non-elite hockey players.

METHOD

Research Model

Experimental-comparative design was used in the study.

Universe-Sample

In the study, 33 elite level male hockey players of hockey super league in the 19-21 age range, played U16, U18 national teams in the past, playing hockey for at least 5 years who was selected U21 national team in the 2021-2022 season and 37 non-elite male hockey athletes of two different team in the 19-29 age range who competed in the indoor 1. league and super league of the Turkish Hockey Federation 2021-2022 season participated voluntarily (Table 1).

Table 1. Descriptive characteristics of elite and non-elite athletes

		Min.	Max.	x̄	SD.
Elite	Age (year)	19,00	21,00	20,16	0,81
	Weight (kg)	60,00	82,00	71,16	5,03
	Height (cm)	166,00	193,00	175,97	5,63
Non-elite	Age (year)	19,00	29,00	20,64	1,85
	Weight (kg)	60,00	85,00	71,28	5,72
	Height (cm)	165,00	193,00	175,58	6,03

Ethical Approval

Ethical compliance of the study was decided in meeting of Kahramanmaras Sutcu İmam University, Medical Research, sub-ethics committee, dated 27 December 2022.

Data Collection Tools

Measurements were applied with computerized programs (for visual reaction, www.humanbenchmark.com; for auditory reaction, www.cognitivefun.net) (Pancar et al., 2016). These are brain speed test measures cognitive processing speed and attention, with a focus on working memory capacity (MyBrainTest.org, 2023). As a result of the literature review, it was seen that it was a computer-assisted test used in many previous international studies (Ištoka, 2020).

Reaction time tests: In the laboratory, where stimuli from the environment are minimized and suitable environment and environmental conditions are provided; two points, auditory reaction test and visual reaction test, were created. Athletes were taken inside one by one, and they were allowed to take the auditory reaction test first and then the visual reaction test. Participants

were accustomed to the test, and after they felt ready, averages of 10 consecutive measurements were taken and recorded by msec.

Analysis of Data

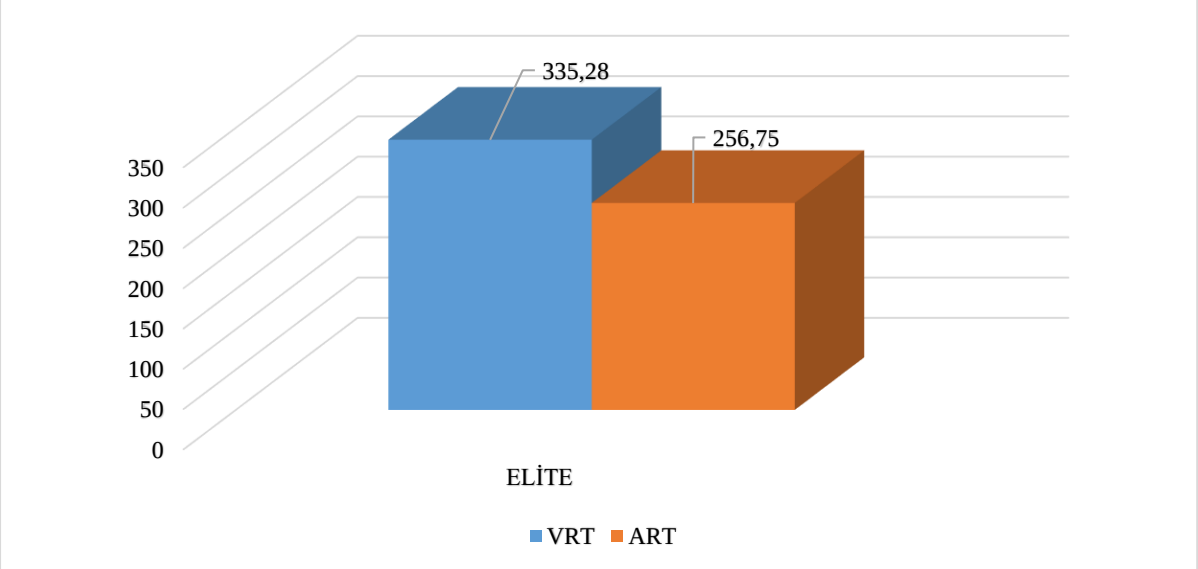
SPSS package program 20.0 (SPSS Inc., Chicago, Illinois, USA) was used in the statistical analysis. Data were presented with max, min, mean and standard deviation. P = 0.05 was accepted as the significance value. Independent samples T test was used.

RESULTS

Table 2. Comparison of reaction times of elite and non-elite athletes between groups

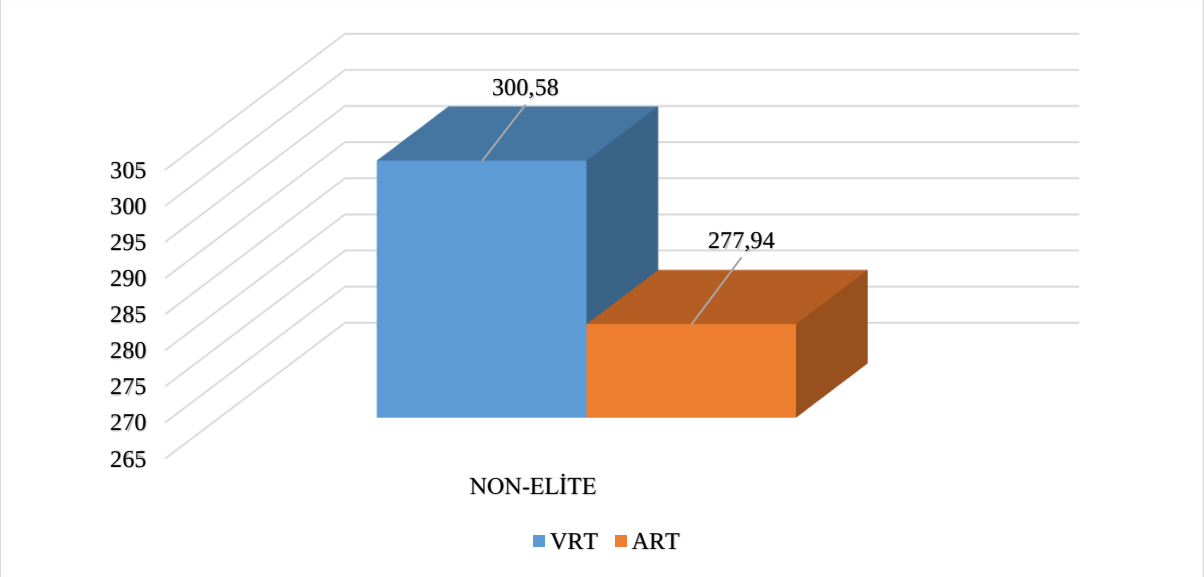
		x̄	SD.	Ss.	t	p
Visual Reaction Time (msec)	Elite	335,28	39,62	7,00	3,27	,00
	Non-elite	300,58	46,91	7,82		
Auditory Reaction Time (msec)	Elite	256,75	37,16	6,57	-2,43	,02
	Non-elite	277,94	34,82	5,80		

Table 2 shows the comparison of VRT and ART of elite and non-elite athletes between groups. As a result of the statistical analysis; A significant difference was found in favor of non-elite athletes in the visual reaction test ($p<0.05$). In the auditory reaction test, a significant difference was found in favor of elite athletes ($p<0.05$).



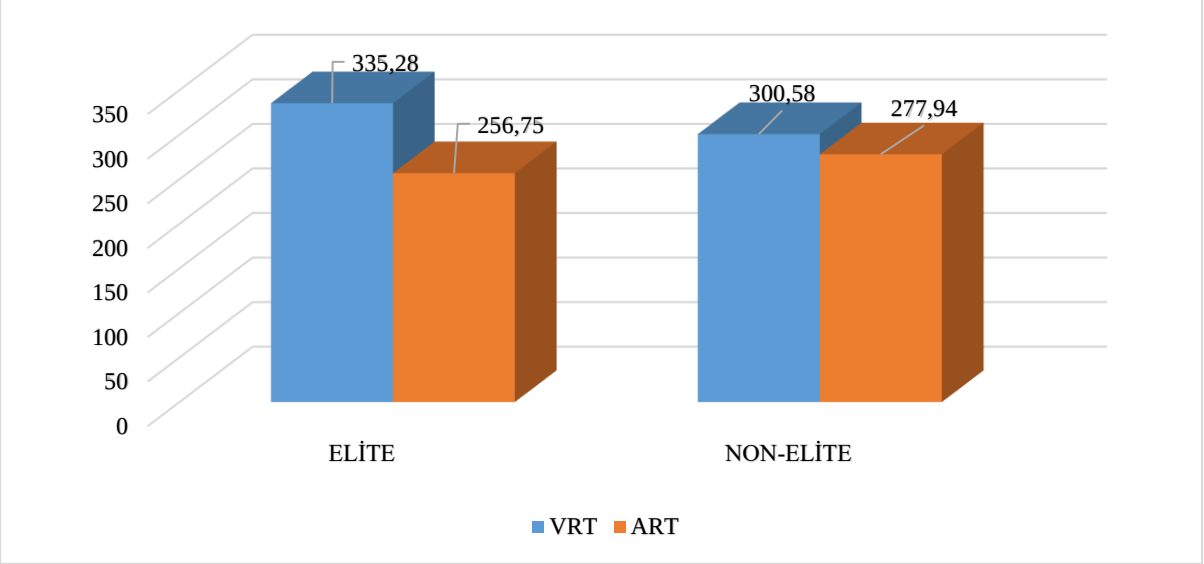
Graph 1. Intra-group comparison of visual and auditory reaction test averages of elite hockey athletes.

As a result, in graph 1; The ART of elite hockey athletes is shorter (msec) than the VRT.



Graph 2. Intra-group comparison of visual and auditory reaction test averages of non-elite hockey athletes.

As a result, in graph 2; The ART of non-elite hockey athletes is shorter (msec) than the VRT.



Graph 3. Between groups comparison of visual and auditory reaction test averages of elite and non-elite hockey athletes.

As a result, in graph 3; The ART of elite and non-elite hockey athletes is shorter (msec) than the VRT.

DISCUSSION AND CONCLUSION

As in most sports branches, talented athletes are needed to win in hockey. The way to overcome the lack of talent in athletes is to work harder. Working with athletes with a high level of talent makes the work of both the employee and the employer easier. In addition to being talented, it is important that the athlete is compatible with the sports branch he is doing. Considering the fact that the speed of the ball can reach up to 160 km in a strong shot in hockey (Eskiyecek, 2017); The athlete must show a superior reaction. Considering the small size of the hockey ball and the width of the playing field; this can prolong the time to confirm that the retina is in the visual field of the ball, so this; This means prolongation of the reaction time. It can be said that the presence of a tool (hockey stick) that should primarily be controlled by the muscles, which are activated in line with the commands received from the central nervous system, will be effective in the delay of the reaction to the stimulus.

In a study conducted on 119 male and 76 female hockey players in Turkey, it was concluded that the age factor affects the VRT (visual reaction time), and that hockey players aged 20-24 have a faster VRT than hockey players aged 19 and younger (Sarı, 2018). For this reason, care was taken to ensure that the individuals participating in our study had similar average age and body mass index. In our study, although the average age of elite and non-elite athletes is close to each other, when the maximum and minimum age values are considered, it is seen that non-elite athletes are older. It can be said that a significant difference in favor of non-elite athletes in the visual reaction test in Table 2 was obtained, and our study reached a common conclusion.

In a study conducted on 50 male university students; auditory reaction time was found to be shorter than the VRT (Colgate, 1968). In our study, when the results obtained from the VRT and ART tests of all elite and non-elite athletes were examined; It is seen that the ART of hockey players is shorter than the VRT and is in parallel with the study.

In some studies, examining the difference between the VRT and ART; athletes that the ART was shorter than the VRT (Jose & Gideon, 2010). It was shown that it would be beneficial to use mental methods as well as other methods in reaching the optimum level of reaction time (Çolakoğlu et al., 1993). Comparing the reaction times of physically active and inactive adolescent girls and boys, it was concluded that physically active adolescents had a better reaction time compared to physically inactive adolescents (Khatri & Ganvir, 2019). The visual and auditory reaction times of male and female athletes between the ages of 14-18 doing team and combat sports, it was found that the visual and auditory reaction times of athletes doing team sports were more positive than those of athletes doing combat sports. In the same study, male athletes had better visual and auditory reaction times than female athletes. It has been determined that their times are better (Aslan et al, 2022).

When some studies similar to this research are examined; eye reflexes and reaction times of elite male and female cricketers, elite rugby players and non-athletes; It has been observed that elite cricketers and elite rugby players have better reaction time performance than non-athletes (Brendan et al., 2016). The effect of visual reaction time training performed for 8 weeks on 15 elite badminton athletes competing in international competitions on the reaction

time performance of the athletes, it was concluded that the VRT performance of the athletes who were applied visual reaction time training improved (Bıdıl et al., 2021). Investigating the relationship between upper extremity length, reaction time and shoulder strength of canoeing athletes, it was concluded that an increase in joint length values of athletes may have a positive effect on visual reaction times (Çelik, 2022).

Basketball and volleyball studies results; examining the changes in reaction time in female volleyball players, no significant difference was found in the test results regarding ART (auditory reaction time) (Küçükipekçi & Taşkın, 2011). Involving male athletes playing basketball and volleyball at the university level, athletes playing volleyball showed better auditory reaction results, while basketball players achieved better results in the visual reaction test (Lodhi & Khakha 2023). Investigating the visual and auditory reaction time, as well as agility and static balance values of female volleyball and basketball players, it was determined that volleyball athletes achieved better results than basketball athletes in visual and auditory reaction performance (Tokgöz, 2022).

As a result, in this study; ART of elite and non-elite hockey players were found to be better than visual reaction times. It has been observed in many studies that the ART is shorter than the VRT (Jose & Gideon, 2010; Colgate, 1968). In addition, a significant difference in favor of non-elite athletes in the VRT test indicate that VRT of non-elite athletes is better than elite athletes. a significant difference in favor of elite athletes in the ART test indicate that ART of elite athletes is better than non-elite athletes.

Conflict of Interest: There is no personal or financial conflict of interest within the scope of the study.

Researchers' Statement of Contribution Rate: Research design NA, MÖ; Statistical analysis NA, ÖFY; Preparation of article NA, AK; Data collection MBC

Information on Ethics Committee Permission Committee: Kahramanmaraş Sütcü İmam University, Medical Research, Sub-ethics Committee, Kahramanmaraş.
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