Original Article

INVESTIGATION OF REACTION SPEED OF THE STUDENTS WHO DO SPORT AND DO NOT IN THE AGE GROUP OF 12-18

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Abstract

Objective: Our research aimed to examine the reaction speed of 12-18 year old students who do sports and those who do not. Material and Methods: A total of 427 students participated in the study, with the participation of 263 boys and 164 girls, aged 12-18, who continue their education in primary and secondary schools in Van. In order to measure the visual and auditory reaction rates, the "Newtest 1000" reaction device was adjusted in 00.01 milliseconds. SPSS package program was used in the data. In analysis, Mann Whitney U for paired comparisons, Kruskall-Wallis H test for multiple comparisons and descriptive statistics were used. The level of significance was determined as $P<0.05$.Results: Exercising regularly ($p=0.000$), using technology intensively (Right-left hand visual $p=0.000$, Right hand auditory $p=0.002$, Left hand auditory $p=0.001$, Right hand mixed $p=0.007$, Left hand mixed $p=0.000$), gender ($p=0.000$), leisure-time situations (Right hand visual $p=0.013$, left hand visual $p= 0.000$, Right hand auditory $p=0.006$, left hand auditory $p=0.102$, Right hand mixed $p=0.049$ There was a significant difference between the left hand mixed ($p=0.002$) and reaction rates. There was a significant difference in left hand auditory reaction rates of individuals who do individual and team sports in favor of those who do individual sports ($p=0.023$). There was no difference between students' ages, parental education levels, dominant hand, body mass index, daily television watching time, wearing glasses, academic achievement and visual and auditory reaction rates ($P>0.05$). Conclusion: It has been observed that regular exercise has a positive effect on increasing reaction speed.

Keywords: Student; reaction speed; sport.

INTRODUCTION

Reaction time has been identified as the period between start of stimulant and start of reaction. Reaction time is one of signs of nerve-muscle performances and is an important element used as criterion in sport environment. Reflex and reaction time should not be confused. In reaction, stimulation comes to central nervous system and is evaluated, then muscle is given order and reaction happens. But, in reflex, spinal cord responds stimulant directly. Reflex is twenty times faster than reaction (Sevim, 2022). Expresses that activity of cortex is important in our reactions. Therefore, this duration is generally longer than durations of the most complex reflexes because stimulant is supposed to pass synapse. Reaction time is a determinant factor for productivity in many sport branches and can be improved with regular work-outs (Çetinkaya, 2011). In individual and team sports, reaction speed is expressed as a common factor of productivity peculiar to sport for athletes (Dodanlı, 2008).

Define reaction time as period between immediate and unexpected stimulant and the reaction given to it. In addition, reaction time changes based on such factors as age, sexuality, tiredness, high altitude, alcohol, nicotine and physicotroptics (Atan and Akyol, 2014). Reaction time is identified as duration between start of stimulation and start of reaction. Duration between the time when an athlete hears sound of gun and the time when he starts movement is reaction time. Reaction time has rather important role in sport. Among the athletes similar to each other physically, the athlete whose reaction time is short is more successful than the other one. Time factor has an important role for athletes. That a tennis player kicks ball at the right time or that an athlete can start movement with the sound of gun is so important in evaluation of performance (Karagöz, 2008). Successful in sport contests an athlete need to have high performance in terms of physical and motor skills. One of the

parameters that enable an athlete to have such performance is reaction time.4 The first response time that muscle shows against chemical and electrical change (impulse) occurring along a nerve fibre as a result of stimulation is called reaction time. As a result of this situation, speed of the response is called reaction speed. Reaction speed is the ability to perceive and react for a movement to put into practice (Yapıcı and Yapıcı, 2013,Ilkım et al 2021). Improvement of reaction time depends largely on concentration power of athlete and his/her focusing the attention to related area. If concentration is headed for performed movement rather than start signal, reaction time of athlete becomes short. If muscles strain isometrically in a certain part of second before start, reaction time becomes short. Lastly, reaction time depends on the duration before start signal (Ziyagil et al. 1994). Complex reaction time is an important part of elite sports. A goalkeeper should decide as immediate as possible which part she will protect during a goal. A tennis player should quickly respond to service of the opposition. In every situation, athlete responds to complex stimulation. Complex reaction time is an important aspects of elite sports (Atan and Akyol, 2014,Ilkım et al 2021).

Materials and Methods

This study, with the purpose of investigating visual and auditory reaction speed of the students who do sport regularly and do not do and continue their education in primary and secondary schools in the age group of 12-18, contains the students continuing their education in primary and secondary schools within the scope of Van Provincial Directorate of National Education. In the study, among 7.777 students who do sport actively in Provincial Directorate of Youth and Sport, 427 students in the age group of 12-18 including 221 athletes doing sport regularly as licensed athlete in Provincial Directorate of Youth and Sport and 206 students who do not do sport have participated voluntarily. In the study conducted with screening model, measurements have been performed with "Newtest 1000" test to determine visual and auditory reaction speed of the students. By repeating measurement ten times for per hand, after the first five of measurements were eliminated and maximum and minimum values of the last five were taken away from each other, measurements were calculated by averaging the rest 3 measurements. Measurements were performed according to 00,01 millisecond. Ethical approval for this study, Ethics Yüzüncü Yıl University Social and Human Sciences Ethics Committee 25.05.2017 and 03 decision. In addition, this study was conducted in accordance with the Helsinki Declaration Principles.

The data gathered has been analyzed by using SPSS statistical package program. In the analysis of data, for multiple comparisons Kruskal Wallis H test and for paired comparison Mann-Whitney U test and descriptive statistics have been used in the situations in which normality and homogeneity of variances have not been provided. Significance level in this study has been determined as $p<0.05$.

Findings

Table 1: Results of Mann Whitney U test in terms of visual, auditory and mixed reaction according to sexuality.

Reaction (ms.)	Groups	N	Mean Rank	Rank Sum	U	P
Right-hand Visual	Females	164	258,31	42362,50	14229,50	**0.000****
	Males	263	186,37	49015,50		
Left-hand visual	Females	164	255,37	41880,00	14782,000	**0.000****
	Males	263	188,21	49489,00		
Right-hand auditory	Females	164	255,73	41940,50	14721,500	**0,000****
	Males	263	187,98	49435,50		
Left-hand auditory	Females	164	263,93	43285,00	13377,000	**0,000****
	Males	263	182,86	48093,00		
Right-hand combined	Females	164	248,91	40821,00	15841.000	**0,000****
	Males	263	192,23	50555,00		
Left-hand combined	Females	164	255,46	41895,50	14766,500	**0,000****
	Males	263	188,15	49482,50		

Mann Whitney U test **p<0.01

As a result of statistical analysis carried out with left-hand and right-hand visual, auditory and combined test results according to sexuality, it has been seen that reaction time is significant in favour of males ($p<0.05$).

Table 2: Results of Mann whitney U test in terms of visual, auditory and combined reactions according to doing sport situation

Reaction (ms.)	Groups	N	Mean Rank	Rank Sum	U	P
Right-hand Visual	Those who do sport	221	157,69	34849,00	10318,000	**0.000****
	Those who do not do sport	206	274,41	56529,00		
Left-hand visual	Those who do sport	221	174,30	34519,50	13988,500	**0.000****
	Those who do not do sport	206	256,59	52858,00		
Right-hand auditory	Those who do sport	221	171,27	37851,50	13320,500	**0,000****
	Those who do not do sport	206	259,84	53526,50		
Left-hand auditory	Those who do sport	221	169,73	37511,00	12980,000	**0,000****
	Those who do not do sport	206	261,49	53867,00		
Right-hand combined	Those who do sport	221	170,68	37721,00	13190,000	**0,000****
	Those who do not do sport	206	260,47	53657,00		
Left-hand combined	Those who do sport	221	168,70	37282,50	12751,500	**0,000****
	Those who do not do sport	206	262,60	54095,50		

Mann Whitney U test **$p<0.01$

As a result of statistical analysis carried out with left-hand and right-hand visual, auditory and combined test results according to doing sport situation, it has been seen that reaction time is significant in favour of those who do sport ($p<0.05$).

Table 3: Results of Mann whitney U test in terms of left-hand auditory reaction according to kind of sport.

Sport Team	N	Mean Rank	Rank Sum	U	P
Team	56	75,40	3317,50	1519,000	**0,023***
Individual	166	64,42	5862,50		

Mann Whitney U test *$p<0.05$

As a result of statistical analysis carried out with left-hand auditory test results according to kind of sport, it has been seen that reaction time is significant in favour of those who do sport in indivdual sport branches ($p<0.05$).

Table 4: Results of Kruskall-Wallis H test in terms of visual, auditory and combined reaction according to using of technology

Reaction/ms	Use of Technology	N	Mean Rank	Sd	X^2	P	Significant Difference
Right-hand visual	Those who do not use	138	241,33	2	16,73	**0,000****	IU-LU, IU -NU, LU- NU
	Limited users (1-3 hours)	232	210,29				
	Intensive users (3-5 hours)	57	162,94				
Left-hand visual	Those who do not use	138	239,72	2	16,28	**0,000****	IU-LU, IU -NU, LU- NU
	Limited users (1-3 hours)	232	211,53				
	Intensive users (3-5 hours)	57	161,80				

Right-hand auditory	Those who do not use	138	240,07	2	12,74	**0,002***	IU-LU, IU -NU, LU- NU
	Limited users (1-3 hours)	232	208,43				
	Intensive users (3-5 hours)	57	173,58				
Left-hand auditory	Those who do not use	138	237,54	2	14,39	**0,001***	IU-LU, IU -NU, LU- NU
	Limited users (1-3 hours)	232	212,27				
	Intensive users (3-5 hours)	57	164,07				
Right-hand combined	Those who do not use	138	233,34	2	09,96	**0,007***	IU-LU, IU -NU, LU- NU
	Limited users (1-3 hours)	232	212,78				
	Intensive users (3-5 hours)	57	172,16				
Left-hand combined	Those who do not use	138	244,00	2	16,95	**0,000****	IU-LU, IU -NU, LU- NU
	Limited users (1-3 hours)	232	207,65				
	Intensive users (3-5 hours)	57	167,23				

Kruskall-Wallis H test **p<0.01 IU (using technology often / 3-5 hours)

Kruskall-Wallis H test *p<0.05 LU (limited use of technology / 1-3 hours)

NU (not using technology)

In the results of using technology test, a statistically significant difference in favour of intensive users of technology (IU) has been found (p<0.05).

Table 5: Results of Kruskall-Wallis H test in terms of visual, auditory and combined according to recreation

Reaction/ms	Recreation	N	Mean Rank	Sd	X^2	P	Significant Difference
Right-hand visual	Game	123	202,82	2	8,62	**0,013***	T-RB, T-G, RB-G
	Reading Book	251	227,25				
	Technology	53	177,18				
Left-hand visual	Game	123	188,32	2	15,33	**0,000****	T-RB, T-G, RB-G
	Reading Book	251	233,50				
	Technology	53	181,13				
Right-hand auditory	Game	123	194,61	2	10,16	**0,006***	T-RB, T-G, RB-G
	Reading Book	251	229,74				
	Technology	53	184,43				
Left-hand auditory	Game	123	203,39	2	4,55	**0,102**	T-RB, T-G, RB-G
	Reading Book	251	224,19				
	Technology	53	190,40				
Right-hand combined	Game	123	199,12	2	6,02	**0,049***	T-RB, T-G, RB-G
	Reading Book	251	226,11				
	Technology	53	191,16				
Left-hand combined	Game	123	196,13	2	12,81	**0,002***	T-RB, T-G, RB-G
	Reading Book	251	231,109				
	Technology	53	174,54				

Kruskall-Wallis H test **p<0.01 T (use of technology)

Kruskall-Wallis H test *p<0.05 RB (reading book)

G (game)

In the results of the test carried out in terms of right hand and left hand visual, auditory and combined test according to recreation, a statistically significant difference in favour of technology users (T) has been found ($p<0.05$).

Discussion and Conclusion

Having looked at right-hand visual reaction speed of the student, in the end of reaction measurement, a significant difference was determined to be in right-hand visual reaction times between the students who do sport and those who do not ($p<0.05$). This situation shows that right-hand visual reaction speed is better in favour of those who do sport. Polat states that quick power and sprint work-outs form statistical difference in right-hand visual reaction times and Yıldırım et. al. points out the same thing for regular tennis work-outs. Moreover, Arslan, found that exercises affected visual and auditory reaction speed positively and Şenel et. al., found right-hand visual reaction time of Turkish national basketballers as (0.17±0.03). Spirduso, expresses that reaction times of individuals whose physical activity levels are high are faster compared to those whose physical activity levels are low. Ölçücü et. al. states that a 12-week tennis training shows a significant difference in sound and light reaction times of children (Polat, 2000; Yıldırım et al. 2011; Arslan, 2014; Şenel et al. 1997; Spirduso, 1975; Ölçüçü et al. 2011)

In our study, a significant difference in terms of left-hand visual reaction speed has been found in favour of the students who do sport ($p<0.05$). Can, found a significant difference among left-hand reaction time values of athletes and sedentaries against light. Akkuş, determined a significant difference between left-hand visual reaction times of students in physical education and sport department and students in faculty of medicine. Polat, found a significant difference in terms of left-hand visual reaction speed in his experimental study (Can, 2007; Akkuş, 1990; Polat, 2000). In our study, in comparisons of data of right-hand auditory reaction measurements, a significant different was found in favour of the students who do sport ($P<0,05$). Polat, found in his study that quick power work-outs affected right hand auditory reaction time positively, and Musabaşıoğlu determined that between individuals who do ski sport and those who do not, among right hand visual reaction times there was a statistically significant difference in favour of those who do sport. Çetinkaya, detected significance in left hand visual times in experimental group of 8-week orienteering exercise (Polat, 2000; Musabaşıoğlu, 2008; Çetinkaya, 2011). States that among atheletes whose mental and physical performances are high reaction time is also high in parallel.8 In our study, in comparisons of data of left-hand auditory reaction measurements, a significant difference has been seen in favour of the students who do sport ($P<0,05$). Keskin, determined that regular physical exercises affect auditory reaction time positively (Keskin, 2008).

Also, Çankaya et. al. claim that work-out programme which they used in order to develop balance enhanced reaction times of individuals (Çetinkaya et al. 2014). Orhan, state that reaction times of the athletes whose anaerobic powers are high are better (Orhan, 2013). Polat, suggest that badminton work-out programme is for improving motoric functions of students in the age group of 9-12 and is important for improving their reaction times (Polat, 2009). Kafkas et. al. has found significant difference in favour of elite athletes in his study in which he compared reaction times of elite and amateur athletes (Kafkas et al. 2009). İmamoğlu et. al. claim in their different study that reaction times of professional footballers (0.16 sec. and 0.17 sec.) are better than those of amateur footballers (0.16 sec. and 0.18 sec.) (İmamoğlu et al. 2000). Boyar, claims that a 16-week football work-out program affected light (visual) reaction times of males children in the age group of 9-14 positively (Boyar, 2013) Ziyagil et. al. said that reaction time against vision stimulant is shorter in trained individuals (0.15 - 0.20 sec.) compared to untrained ones (0.24-0.35 seconds). Reaction time against voice stimulant is generally less shorter compared to light. International athletes have 0.05-0.06 seconds as reaction time values against voice stimulant and this value is around 0.17-0.27 seconds in untrained athletes (Ziyagil, et al. 1994). In comparisons of measurement data of right-left hand combined reaction which is another variance of our study, a significant difference has been seen in favour of students who do sport ($P<0,05$). In the light of these findings, it can be said that right-left combined reaction speeds of the students who do sport are better compared to those of the students who do not do sport Yıldırım et al. claim that a 3-month workout applied to girls playing tennis enhanced right-left hand visual and auditory reaction times positively (Yıldırım et al. 2011). Suggest that reaction time can be enhanced by means of exercise (Shamsabad, 2015). In the study which Karagöz, Chandra et. al. and Özer, conducted, a fall in visual and auditory reaction time was found after exercise (Karagöz, 2008; Chandra, 2010; Özer, 2007).

In the end of reaction measurement in our study, a significant difference has been found in left-hand visual reaction times in favour of those who do individual sport between the students who do individual sports and those who do team sports ($P<0.05$). Although there are studies related to comparison of reaction times among sport branches in literature, the studies in which reaction times of individual sports are compared with reaction times of team sports are limited. Studies related to this topic can be done. Maite et. al. claim that there is a little and significant difference after season between football and volleyball groups

in their experimental studies (Maite, 2016). Erzurumluoğlu et. al. determined optic reaction values of students who study in universities and do sport in different branches as (256.91±10.19) millisecond in volleyball players, (262.74±23.92) in footballers, (282.13±47.23) in basketballers, (287.55±54.35) in wrestlers and (322.2±101.42) in handballers from the shortest time to the longest time. In the light of this information, it is claimed that the reason why volleyball players have better reaction time is because this sport requires responding to stimulant quicker. However, according to the finding of the study that we conducted, it is thought that reaction speeds of those who are in individual sport branches are better because their sports require good concentration and timing (Erzurumluoğlu et al. 1999). Nuri et al. claim that sprinters have faster reaction respond against auditory stimulants in reaction duty compared to volleyball players (Nuri et al. 2013). Gürsoy et. al. suggest, within the scope of the results they got from the individuals attending the study to investigate the relationships between reaction times and some biomotoric features in those who do sport in different branches and those who do not do sport, that footballers have significantly better reaction times than wrestlers and athletes have and claim that handballs have better reaction times compared to athletes. Also, they state that while footballers, wrestlers and handballs are significantly better compared to female volleyball players, difference between female volleyball players and male athletes is little if any. They say that the fact that reaction time of athletes is not good is because subject group consisted of long distance runner not sprinters (Gürsoy, 2017).

In our study, a significant difference has been found in favour of students who use technology intensively in right-left hand visual-auditory reaction times and right-left hand combined reaction times ($p<0.05$). Based on these findings, use of technology can be thought to affect visual and auditory reactions positively. As reason for this, it can be thought that use of technological devices such as computer, mobile phone, tablet etc., especially during playing games, requires constant visual and auditory concentration, and in parallel with this, reaction responds are constant.

In our research, a significant difference has been determined in visual and auditory reaction speeds in terms of use of technology in free time and sexuality ($P<0.05$). In this context, it has been found that left-hand visual reaction times of male students are shorter compared to female students just as right hand visual reaction times of male students are shorter. Binboğa et. al. has detected that although auditory simple reaction times of males are shorter than those of females, difference between them is not statistically significant (Binboğa et al. 2007). Alpkaya, claims that males have faster reaction times than females have in age groups and all groups in his study which he conducted to research effect of age, sexuality, and physical activities on reaction time Alpkaya, 2001). Kayapınar, claims that females in the age group of 6-7 have more developed visual simple and visual optimal reaction times and hand-eye coordination than males have (Kayapınar, 2002). Lord et. al. state that in their study, quadriceps strength of the women attending exercise program enhanced in keeping with reaction time test compared to women who do not do exercise. In our study, it has been determined that reaction speeds of males are better than those of females (Lord et al. 1993). Merdan, points out that in their study, attention and coordination workouts done with a certain period affected hand-eye coordination positively (Merdan, 2016). İmamoğlu and Kılcıgil states that in their study called "reaction time in the tiny footballers in Turkey, vital capacity values and lateralization distribution of left-handedness problem ", reaction times can improve with workout in addition to the fact that tecniqu and tactic skills for the position of footballers are useful in training of footballers (İmamoğlu and Kılcıgil, 2007).

As a result, according to the findings of our study it has been seen that reaction time of those who do sport is shorter. Visual and auditory reaction times of males are shorter than those of females. This situation shows that visual and auditory reaction speeds of males are better. Visual and auditory reaction speed of those who do sport in kind of individual sport are better. Also, visual and auditory reaction speeds of the students who use technology intensively during the day are high. In addition, visual and auditory reaction speeds of the students who spend their free time with technology are higher.

Ethical Approval

Ethical approval for this study, Ethics Yuzuncu Yil University Social and Human Sciences Ethics Committee 25.05.2017 and 03 decision.

Informed Consent

Written informed consent was obtained from each subject.

Source of Finance

During this study, no financial or spiritual support was received

neither from any pharmaceutical company that has a direct connection

with the research subject, nor from a company that provides

or produces medical instruments and materials which may

negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Savaş Aydın, Zekiye Özkan, Design: Zekiye Özkan, Savaş Aydın; Control/Supervision: Zekiye Özkan; Data Collection and/or Processing: Savaş Aydın, Zekiye Özkan, Analysis and/or Interpretation: Zekiye Özkan, Savaş Aydın; Literature Review: Zekiye Özkan, Savaş Aydın; Writing the Article: Savaş Aydın, Zekiye Özkan, Critical Review: Zekiye Özkan, Savaş Aydın; References and Fundings: Savaş Aydın, Zekiye Özkan, Materials: Savaş Aydın, Zekiye Özkan.

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