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EXAMINATION OF REACTION TIME AND BALANCE RELATION IN CHILDREN BETWEEN THE AGES 9-13

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ABSTRACT

The aim of this study was to explain the relationship between reaction times (right-left hand visual and auditory) and balance (static balance) in children between the ages 9-13. 74 male and 46 female, as a total of 120 students between the ages 9-13 from Ankara Batı College were voluntarily participated in this study. Visual and auditory reaction times were measured by Newtest 1000 reaction timer and Flamingo Balance Test was used to test static balance of players.The data was analyzed by using "Non-parametric Spearman Correlation Test" in SPSS software.The average visual reaction time of subjects for right and left hand were 448,33 ± 156,05 msec and 447,88 ± 142,70 msec respectively, Right and left subjects' auditory reaction time was 451,95± 166,83 msec and 460,48± 166,24. Right and left dynamic balance scores were obtained 30,37 ± 38,23 sec and 30,72 ± 41,84 sec. respectively. As a result of the research subjects' reaction to the right visual balance with the right ($r = -212$; $p < 0.05$) and left-balance ($r = -183$; $p < 0.05$), The right balance with the right auditory reaction ($r = -235$, $p < 0.05$) negative correlation was found between scores. Age of the subjects with the right visual reaction ($r = -600$; $p < 0.05$), the left hand visual reaction ($r = -599$, $p < 0.05$), right-hand visual reaction ($r = -571$, $p < 0.05$), the left hand visual reaction ($r = -544$, $p < 0.05$) negative relationship found between the variables. However , there is no relationship between the balance and age variables.

Key Words: Children, reaction time, balance, exercise.

INTRODUCTION

Each person has ability of moving but improvement rate of this ability differs from person to person. Measurement of this improvement is determined by sensory-motoric structure of the person(Tudor & Gregory, 2006). Balance ability is also the component of this structure. It is defined as holding the body in balance and protecting the situation during and after the body changes its place(Altay, 2001). Landing ability of the gymnast after a movement by keeping his balance and getting proper position ability of a football player by keeping his balance according to the ball coming by controlling the position of his team players and opponent in the same time or keeping balance ability of a basketball player when he lands with ball after rebound which he goes with opponent are very important in terms of performance(Erkmen, 2006). It is considered that reaction time of a person who completes the movement in controlled and balanced way to a new stimulus is shorter and in this point shortness of reaction time is also important. Reaction time is a inherited feature which determines the time between the first muscular reaction of a person against stimulus or realizing the movement(Tudor & Gregory, 2006). It is known that during growth period, reaction time improves very quickly and the highest level is obtained in above 15 years and below 20 years, it follows a stable line in adult level[4]. Although movement education in children has positive effect on reaction time and balance(Çakiroğlu, Sökmen, & Arslanoğlu, 2013; Polat, 2009), it is not mentioned whether there is a association between reaction time and balance or not. The aim of this study was to explain the relationship between reaction times and balance variables in children between the ages 9-13.

MATERIAL AND METHOD

74 male and 46 female, as a total of 120 students between the ages 9-13 from Ankara Batı College were voluntarily participated in this study. Visual and auditory reaction times were measured by Newtest 1000 reaction timer and Flamingo Balance Test was used to test static balance measurement(Colakoglu et al., 2014). Height was measured by "Holtain" brand stadiometer and weight was measured by Tanita brand bascule. Visual and auditory reaction times of experimental objects were measured by Newtest 1000 reaction timer. In the measurement of reaction times, it was paid attention to make measurement in a quiet and luminous place. 1 trial and later 3 measurements against sound and light stimulus were taken from each experimental object. The best value of the last 3 measurements was recorded as score of experimental objects in milimetric. Flamingo Balance Test was used to test static balance measurement of experimental objects participated into the research. Experimental object stepped up on balance equipment in 50 cm length and 4cm height and 3 cm width and stood in balance and the time which experimental object stood in balance was determined by chronometer and recorded in second. Data obtained from the research were analyzed in $p<0.05$ significance level using non-parametric Spearman correlation test in SPSS (Statistical package for social sciences) package program.

RESULTS

Table 1. Average and Standard deviation values of height, weight, reaction and balance parameters of the group participated into the research.

	Height (m)	Weight (kg)	BKİ	Visual Right Hand Reaction (ms)	Visual Left Hand Reaction (ms)	Auditory Right Hand Reaction (ms)	Auditory Left Hand Reaction (ms)	Balance Right Foot (sn)	Balance Left Foot (sn)
Mean	**1,49**	**44,50**	**19,93**	**448,33**	**447,88**	**451,95**	**460,48**	**30,38**	**30,72**
Median	**1,49**	**42,00**	**19,44**	**422,50**	**425,50**	**445,00**	**452,50**	**17,89**	**17,22**
Standard Deviation	**0,10**	**12,06**	**3,97**	**156,06**	**142,70**	**166,84**	**166,25**	**38,23**	**41,85**
Minimum	**1,27**	**24,0**	**12,42**	**180**	**202**	**160**	**160**	**1,89**	**2,86**
Maximum	**1,73**	**72,0**	**32,41**	**866**	**898**	**1152**	**1126**	**240,51**	**298,77**

In table 2, values of experimental objects were determined as follows average height is 1,49 ± 0,10cm, weight is 44,50±12,06kg, body mass index is 19,93±3,97 and average visual reaction times respectively right and left are 448,33 ± 156,05 msn and 447,88 ± 142,70 msn, auditory reaction times respectively right and left are 451,95± 166,83 msn and 460,48± 166,24, right and left balance scores are 30,37 ± 38,23 sn and 30,72 ± 41,84 sn.

Table 2. Distribution of students participated into the research according to age.

	9	10	11	12	13	Total
Frequency	*15*	*22*	*16*	*50*	*17*	***120***
Percentage	*12,5*	*18,3*	*13,3*	*41,7*	*14,2*	***100***

Table 3. Correlation of balance and reaction times of the group participated into the research.

VARIABLES	Age	Visual Right Hand Reaction (ms)	Visual Right Hand Reaction (ms)	Auditory Right Hand Reaction (ms)	Auditory Left Hand Reaction (ms)	Balance Right Foot (sn)	Balance Left Foot (sn)
Age	*1,000*	*-0,600**	*-0,599**	*-0,571**	*-0,544**	*0,059*	*-0,006*
Visual Right Hand Reaction (ms)		*1,000*	*0,737**	*0,756**	*0,773**	*-0,212**	*-0,183**
Visual Left Hand Reaction (ms)			*1,000*	*0,760**	*0,807**	*-0,170*	*-0,102*
Auditory Right Hand Reaction (ms)				*1,000*	*0,857**	*-0,235**	*-0,104*
Auditory Left Hand Reaction (ms)					*1,000*	*-0,168*	*-0,091*
Balance Right Foot (sn)						*1,000*	*0,630**
Balance Left Foot (sn)							*1,000*

*Correlation is statistically significant in 0.05 level.

In Table 3, a negative relation was determined between right visual reaction and right balance (r=-212; p<0,05) and left balance (r=-183; p<0,05), right visual reaction and right balance (r=-235; p<0,05) scores of experiment objects. While a negative relation was found between age and right visual reaction (r=-600; p<0,05), left hand visual reaction (r=- 599; p<0,05), right hand auditory reaction (r=-571; p<0,05), left hand auditory reaction (r=-544; p<0,05)variables, there is no relation betwen age and balance variables.

DISCUSSION AND RESULT

Although it is encountered that balance and reaction time are examined separately in the literature, there is limited studies examining particularly the balance and reaction relation. Cuisinier et al. observed that postural balance in children between the ages of 7-11 increased with age linearly(Cuisinier, Olivier, Vaugoyeau, Nougier, & Assaiante, 2011). Kiselev et al. found that reaction time to various stimulus shortened depending upon the age in the study of children between the ages of 4-5-6(Kiselev, Espy, & Sheffield, 2009). Lida et al. found that simple reaction time decreased as age increases significantly in the study which they conducted on 153 children between the ages of 6-12(Iida, Miyazaki, & Uchida, 2010). Mickle et al. (2011) found that balance increases with age in 84 children between the ages of 8-12(Mickle, Munro, & Steele, 2011). In our study, while negative relation was found between age and right visual reaction (r=-600; p<0,05), left hand visual reaction (r=- 599; p<0,05), right hand auditory reaction (r=-571; p<0,05), left hand auditory reaction variables (r=-544; p<0,05), there is no relation between age and balance variables (p<0,05). Findings show parallelism with studies excluding Cuisinier et al. Vuilema and Nougier compared the gymnasts with football and handball players in their study. They stated that there is no difference between groups in balance and reaction time measurement(Vuillerme & Nougier, 2004). In another study it was found that there is no relation between reaction times and dynamic balance scores of elite man badminton players in their study(Arslanoğlu, Aydoğmuş, Arslanoğlu, & Şenel, 2010). Ihıra et al.(2011) found that reaction time increased depending upon the increase of balance loss in the study(Ihira, Furuna, Makizako, & Miyabe, 2009). There is no negative relation between right visual reaction and right balance (r=-212; p<0,05) and left balance scores of experimental objects (r=-183; p<0,05), between right auditory reaction and right balance (r=-235; p<0,05) scores of objects (p<0,05). Findings support the study of Ihıra et al.As a result, a negative

relation was found between reaction times and age of children in the ages of 9-12. Accordingly it is considered that reaction time decreases due to increase in children' control on movements and the effect of age factor in addition to this control increase.

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