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**ANALYSIS OF ATTENTION, EYE-HAND COORDINATION AND
REACTION TIME OF YOUNG SOCCER PLAYERS**

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Abstract

The purpose of the present study was to evaluate the skills that will positively influence child development, such as attention, eye-hand coordination and reaction time, among young competitors and non-competitor soccer players. A total of twenty six soccer players (Non-competitor soccer group: 13 players who practice two days a week at Lara Soccer School; Competitor soccer group: 13 players playing in Lara Soccer Club) aged between 10-12 years took part in present study. Cognitrone Test (Vienna Test System), Lafayette Two-Arm Coordination Test and Reaction Time Test were administered to the participants. According to the results of Cognitrone test, there was a statistically significant difference between the two groups in terms of the mean time of correct rejections and the total working time. It can be said that decision time in the attention test of competitor soccer players is better than that of non-competitor. In reaction time test, there was no significant difference between competitor and non-competitor soccer player in recessive hand reaction time, dominant and recessive hand percentage of success. However, competitor soccer players had significantly better dominant hand reaction time than the non-competitor soccer players. Results of two arm coordination test revealed that, there were no significant differences between competitors and non-competitor soccer players in two arm coordination time and accuracy. According to the results of the present study it can be said that being a competitor in soccer young league has a positive effect on percentage of success in the reaction time and decision time in eye-hand coordination test.

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Keywords: “Young,” “soccer,” “attention,” “eye-hand coordination,” “reaction time.”



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1. Introduction

Attention, concentration, eye-hand coordination and reaction time are considered to be integral basics of sports. The attention-grabbing physical and mental characteristics of human nature have been included in the sports literature as general information, particularly in research articles that analyse how much various activities done for a certain period of time affect them (Bańkosz, Nawara, & Ociepa, 2013, Boot et al. 2008 Crawford, Medendrop & Marotta, 2004, Ederman, Murray, Mayer & Sagendorf, 2004, Göral, Saygın & İrez, 2012).

Attention is the conscious or unconscious focus of perception on a certain object, action, activity, situation, event or phenomenon, which determines the quality of decision-making and performance (Schefke, & Gronek, 2010). Attention and concentration are among the important factors for athletic performance in sports. Some changes are observed in people who focus their psychological and physical energy on a single point. Sense organs focus on the people, objects or events in question so as not to miss any details. In addition to the sense organs, athletes' bodies also adjust (Özerkan, 2004).

Visual motor coordination is defined as receiving visual stimuli and generating appropriate motor answers with mind-body coordination. This is known as eye-hand coordination. The visual-motor coordination skills include: walking, running, jumping, climbing, cooking, dressing, undressing, buttoning, washing hands and face, brushing teeth, cycling, driving, using computer, coloring, reading-writing and using scissors. In addition, they play a significant role in self-sufficiency and successful school and social life. The development of visual motor coordination in children starts with directing towards various objects within their visual field and using their body and hands (Ercan & Aral, 2011).

Athletes should have high physiological and motor performance for success in sports. Particularly for football players, it will provide an advantage if the events are arranged in advance and they make a move before their opponents. One of the parameters that will allow them to gain advantage is their reaction time. Reaction time refers to the time that passes from between receiving a sudden and non-prefigured signal to responding to this signal. The stimuli can be auditory, visual or tactile (Göral, Saygın & İrez, 2012).

This study evaluates the skills considered to have positive effects on both child development and sportive performance such as attention, eye-hand coordination and reaction time of young competitor (CP) and non-competitor (NCP) football players..

2. Problem Statement

Examination of skills, such as attention, eye-hand coordination and reaction time in competitors and non-competitor soccer players will provide information for coaches to plan and organize training program..

3. Research Questions

Is there any difference between competitor and non-competitor soccer players in attention, eye-hand coordination and reaction time?.

4. Purpose of the Study

The purpose of present study was to evaluate the skills that will positively influence child development, such as attention, eye-hand coordination and reaction time, among young competitors and non-competitor soccer players..

5. Research Methods

5.1. Participants

The study was conducted with 26 ten- to twelve-year-old football players, 13 non-competitor football players training twice a week at Antalyaspor Lara Football School and 13 competitor football players playing for Laraspor Football Club. The licensed football players who competed for Lara Sports Club were included in the competitor group, and the non-licensed players who attended the football school, but did not compete, were included in the non-competitor group.

5.2. Methods

The assessments were made at the Laraspor Football Club. The attention, eye-hand coordination and reaction time tests were administered to both groups in the meeting area in the training ground.

Cognitrone Attention-Concentration Test (COG); Cognitrone is a general ability test that assess attention and concentration among the Vienna test system batteries. It requires noticing the similarities between constantly changing figures within the tests' integrity and reacting rapidly and correctly. Participants are asked to compare the figures on the screen and make a decision about their similarities. Four different figures are displayed on the upper part of the screen, and one figure is displayed on the lower part. Participants are asked to press the green button on the panel with their right hands when they understand that the figure on the lower part matches with the figure on the upper part; or otherwise, to press the red button. The total duration of the test is 15 to 20 minutes (Psikotek Consulting, 2012).

Eye-Hand Coordination Assessment; Eye-hand coordination was assessed using the Two Arm Coordination Test. This test was done using the Lafayette Instrument Two-Arm Coordination Tester Model 32532A and the Lafayette Instrument Silent Impulse Counter Model 58024C (Lafayette, 2004). This test assesses the participants' two eye-hand coordination by tracking the star on the test device using a metal pointer with both hands clockwise and counter-clockwise. Whenever the participants deviate from the trace they should track, the stimulant counter records it (Green,1996).

Reaction Time Suite; Reaction time was assessed using the Reaction Time Suite together with the ProComp Infinity device and Biograph Infinity software. Visual and auditory reaction times were assessed using computers. In single assessment, the computer sends a single stimulant (visual or auditory), and the participants react to this stimulant by pressing the button as quickly as they can. If the participants do not answer a stimulant or give their answer in the wrong order, this counts as an error (Thought Technology, 2012).

The statistical analysis of the data was done using SPSS and Excel (Analyses Tool Pack) software. First, the data were subjected to descriptive statistics. The normal distribution criteria were determined using the Shapiro-Wilk test since the sample size was under 50. The independent samples t test was used

for normally distributed variables, and the Mann-Whitney U test was used for non-normally distributed variables during the comparison of competitor and non-competitor groups. Results are shown as mean \pm SD, and for all comparisons $p < .05$ was considered significant.

6. Findings

A total of 26 football players (13 competitors and 13 non-competitors) from the Laraspor Football Club and Antalyaspor Lara Football Academia voluntarily participated in the study with their families' permission.

The Cognitrone Test, a computer-based attention test, as well as the Reaction time Test through the Reaction Time Suite and Lafayette Two Arm Coordination Test were administered to the participants. The competitor group was significantly older than the non-competitor group ($p < 0.05$).

Table 01. Attention test values of competitor and non-competitor soccer players who participated in the study.

	Competitor Soccer player (CP) (n=13)			Non-Competitor Soccer player (NCP) (n=13)	
	Mean	S.D.		Mean	S.D.
Mean time of correct rejections (sec)	2.52	0.68	t=-2.77 p=.01	3.26	0.67
Sum of correct rejections	28.31	4.42	Z=-1.802 p=.72	31.00	3.96
Mean time of correct reactions (sec)	2.15	0.54	t=-1.85 p=.08	2.58	0.63
Sum of correct reactions	19.00	3.27	Z=-1.871 P=.06	21.15	2.30
Working time (sec)	142.62	38.09	t=-2.78 p=.01	181.85	33.72
Sum of misses	12.69	6.25	Z=-2.367 p=.18	7.85	5.27

No significant difference was found between CP and NCP sum of and mean time of correct reactions, the sum of correct rejections and sum of misses ($p > 0.05$). A statistically significant difference was found between the competitor and non-competitor groups in terms of the mean time of correct rejections (CP=2.52 \pm 0.68 sec, NCP=3.26 \pm 0.67 sec) ($p < 0.05$).

The competitor group showed significantly shorter mean times of correct rejections than the non-competitor group. A statistically significant difference was found between the groups in terms of the working time (total processing time) (t=-2.78, $p = .01$). The competitor group obtained a better mean score on the Cognitrone Test than the non-competitor group in terms of the working time (CP=142.62 \pm 38.09 sec, NCP=181.85 \pm 33.72 sec).

The reaction time of the competitor and non-competitor groups were assessed using the ProComp Infinity device and Biograph Infinity software, as well as the Reaction Time Suite. Table 02. shows the reaction time results of the competitor and non-competitor football players.

Table 02. Reaction times values of competitor and non-competitor soccer players who participated in the study.

	Competitor Soccer player (CP) (n=13)			Non-Competitor Soccer player (NCP) (n=13)	
	Mean	S.D.		Mean	S.D.
Dominant hand reaction time (msec)	243.39	28.41	t=-2.80 p=.01	279.79	33.90
Dominant Hand success percentage (%)	90.31	16.23	Z=-1.316 p=.19	79.72	24.28
Recessive Hand Reaction time (msec)	246.09	12.76	Z=-1.808 p=.07	270.00	33.12
Recessive Hand success percentage (%)	90.71	19.26	Z=.070 p=.94	91.37	14.73

No statistically significant difference was found between the competitor and non-competitor groups for recessive hand reaction time ($Z=1.808$, $p=0.07$), recessive success rate ($Z=0.070$, $p=0.94$) and dominant success rate ($Z=1.808$, $p=0.071$) ($p>0.05$). The two groups obtained similar values in these variables. The dominant hand reaction time of the competitor group (243.39 ± 28.41 msec) was statistically significantly lower than that of the non-competitor group (279.79 ± 33.90 msec) [$t=2.80$, $p=0.01$]. The dominant hand success rate was also found to be statistically significantly higher in the competitor group (90.31%) than in the non-competitor group (79.72%). No statistically significant difference was found between the recessive hand reaction times of the groups [$Z=1.808$, $p=0.071$] ($p>0.05$). The competitor group obtained better scores in dominant reaction time than the non-competitor group.

The eye-hand coordination of the participants was assessed using the Lafayette Instrument Two-Arm Coordination Tester Model 32532A.

Table 03. Eye-hand coordination values of competitor and non-competitor soccer players who participated in the study.

	Competitor Soccer player (CP) (n=13)			Non-Competitor Soccer player (NCP) (n=13)	
	Mean	S.D.		Mean	S.D.
Clockwise time (sec.)	25.30	4.07	t = 1.45 p = .16	23.09	3.67
Counter-clockwise time (sec.)	25.00	4.37	t = 0.84 p = .41	23.55	4.42

Number of Clockwise error	7.69	5.68	Z= -.901 p = .37	9.62	9.69
Number of Counter-clockwise error	8.00	5.29	Z= .052 p = .96	8.31	5.34

7. Conclusion

Attention, coordination and reaction time, parts human nature, are cognitive and mental processes used in every sphere of life. These characteristics are complex in terms of their process and results in both cognitive and behavioural aspects. Success in physical and mental terms is needed in every kind of sports. Sports include movement and activity, and therefore is directly related to attention, coordination and reaction time, the subjects of this study. In addition, ability in these factors will possibly have positive effects on the quality of physical appropriateness factors as well as psychological factors.

The football players' attention variables were assessed using the Cognitrone Test, and a statistically significant difference was found between the two groups for only the mean time of correct rejections and working time. The competitor football players had better decision-making times than the non-competitor football players in the attention test.

The results of competitor and non-competitor football players in recessive hand reaction times and dominant and recessive hand success percentage were similar, and the differences between the groups were not statistically significant. A statistically significant difference was found between the dominant hand reaction times of the two groups. The competitor football players had a better reaction time.

No study was found in the literature that compares competitor and non-competitor football players in this age group in terms of these variables. This section refers to different studies in the literature.

Bayar and Koruç (1992) assessed the reaction time and eye-hand coordination of the students in summer sports school at the 19 Mayıs Sports Site who were born between 1977 and 1982 and observed that female students born in 1982 had a shorter reaction time than male students at the same age. However, males' reaction times shortened and females' reaction times lengthened as they got older (Boyar, 2013).

A study that aimed to determine the light (visual) reaction times of male football players aged between 9 and 14 found that a football training program provided for 16 weeks positively affected children's light (visual) reaction time (Boyar, 2013).

Marancı (1999) conducted a study with amateur football players and found that the reaction times to a visual stimulant were 470 msec for goalkeepers, 530 msec for defensive players, 510 msec for midfield players and 490 msec for strikers. Their reaction times to an auditory stimulant were 397 msec for goalkeepers, 490 msec for defensive players, 430 msec for midfield players and 420 msec for strikers (Marancı, 1999).

No significant difference was found between the competitor and non-competitor football players for the clockwise time, counter-clockwise time, number of clockwise and counter-clockwise error variables. The football players in both groups obtained very similar results in eye-hand coordination.

In conclusion, this study found that the attention and the dominant hand reaction time were different between competitor and non-competitor trained male football players aged between 10 and 12,

and that being a competitor or non-competitor did not affect their eye-hand coordination. It can be concluded that similar trainings of the competitor and non-competitor football players led these groups to show no difference.

Attention, reaction time and coordination are important variables that create the difference between successful and unsuccessful players in football. Therefore, trainers and physical educators should use the attention, coordination and reaction time exercises starting at an early age to stimulate these athletic skill

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