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# Nonverbal intelligence of soccer players according to their age, gender and educational level

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## Abstract

This study was to investigate the nonverbal intelligence of soccer players according to their age, gender and educational level. For this purpose, data were collected from 353 soccer players using adapted version of the TONI-2. The soccer players had a mean age of 14.78 years. Collected data was analyzed by ANOVA for age groups, t statistics for comparisons of gender and level of education. ANOVA and t statistics of the data revealed the significant differences between age groups, gender and level of education. Multiple comparisons showed that TONI-2 points increased with the age from 13 through 17 in order. Results also indicated that female players from male players and high school players from secondary school players have higher TONI-2 points in soccer.

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*Keywords:* Nonverbal intelligence; soccer; age; gender; educational level.

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## 1. Introduction

How important is intelligence to sport performance? Do athletes have to be "smart" to excel in sport? Could an individual be "dumb" and execute complex motor tasks proficiently? What do we mean by intelligence in a sport sense? Could proficient sport performance be in any way construed to be an outgrowth of an athlete's intelligence? Is it possible that those individuals we term "natural athletes" are highly sport intelligent, and is it this intelligence that allows them to be successful across several sport areas? These questions are endless related to sport intelligence (Fisher, 1984).

Behavior can only be as intelligent as the way in which world events are represented in the brain. This is referred to as encoding and it is closely related to perception and attention (Fisher, 1984; Merteniuk, 1976). Therefore, it seems that nonverbal intelligence in particular is related to perception and attention. Tenenbaum and Bar-Eli (1995) also discussed intelligence with reference to intellectual capabilities required for successful athletic activity, such as information processing, knowledge, experience, decision making, reaction time, timing, memory and recall, vision,

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sensorimotor processing, attention, anticipation, cognitive styles, and time and space perception. These all seem to be related to nonverbal intelligence in sport.

Limited number of studies in sport related intelligence concentrated on: academic performance of varsity athletes and their intelligence (Reeder, 1942), group intelligence, group placement, physical efficiency and performance (Milne, Cluver, Suzman, Wilkens-Steyn and Jokl, 1943; Start, 1961), mental functions, athletic ability, personality problems, affectivity and intelligence (Froelich, 1944), ability to learn sport-type gross bodily motor ability and the effect of intelligence on motor learning and performance of motor skills (Brace, 1948), power and mental ability of nonathletes' and athletes' participation in different sports (Burley, 1955), mental ability and skill in badminton and tennis (Thorpe, 1967), conceptual symbol identification, physical ability, intelligence in hockey and gymnastics (Miloslov, 1974), physical exercises, performance, successful orientation, expectations of achievement (Rocusfalvy, 1976), personality factors, high-achievers and low-achievers in tennis and badminton (Bushan and Agarval, 1978), superior intellectual functioning, peak performance and intellectual excellence (Privatte, 1982), intellectual abilities, technical competence, experience and effective team performance in basketball (Fiedler, McGuire and Richardson, 1989), heredity, well-being, physical attributes, personality characteristics, information processing capabilities, and intelligence (Singer and Janelle, 1999), psychological characteristics of Olympic champions, coping with and controlling anxiety; confidence; mental toughness/resiliency; sport intelligence (Gould, Dieffenbach and Moffeth, 2002), influence of intelligence in the terminal phases of information processing and motor programming (Alves and Martins, 2003).

Researches are also very limited related to soccer intelligence. Limited research in soccer intelligence indicated that soccer-expert children recalled more items on the soccer list but not on the nonsoccer list than soccer-novice children. However, soccer expertise did not modify a significant effect of IQ level, with high-IQ children recalling more than low-IQ children for all contrasts. Interest in soccer was found to be related to expertise but did not contribute to differences in memory performance (Schnider and Bjorklun, 1992). Bjurwill (1993) discussed problems of vision and intelligence related to one-touch play in soccer. He put forward that one-touch play is likely to become the type of football that can be seen most often in the future. Practicing one-touch play needs players who are creative in reading the game and in reacting quickly.

Intelligence tests are widely used in schools, in industry, in other sectors of our communities. Unfortunately, few suitable tests have been developed for use with populations who require language free, motor reduced or culture reduced testing formats, like Test of Nonverbal Intelligence-2/TONI-2 (Konter and Yurdabakan, 2009; Brown, Sherbenou and Johnsen, 1990). Problem solving is the bases of all original TONI-2 items. The authors chose problem solving because it appears to be a general component of intelligence and can be approached with abstract content and a nonverbal format. Subject is presented a set of figures in which one or more of the figures are missing. The subject then answers by identifying a relationship among the figures. The subject completes the relationship in figures by selecting the correct response from among either four or six alternatives. Scores are identified by referring to the raw scores and age intervals (Brown, Sherbenou and Johnsen, 1990).

Football is the world's most popular form of sport, being played in every nation without exception (Reilly, 1996). As indicated above, there is almost no research existing that uses TONI-2 in sport related settings, particularly in soccer. This research might be an important contribution to using TONI-2 in soccer, since soccer, most of the time, involves nonverbal interaction, communication and problem solving skills of players in connection with time and space. An important part of interpersonal communication involves nonverbal communication, or nonverbal cues.

Research indicated that nonverbal communication is also critical to imparting and receiving information (Weinberg and Gould, 2003). People are often unaware of the many nonverbal cues they use in communicating. In fact, estimations from various researchers indicate that approximately 50 % to 70 % of the information conveyed in a communication is nonverbal. Therefore, it is critical that coaches, athletes, and exercise leaders be extremely observant of their nonverbal cues (as well as those of others) as a rich source of information. Understanding the various kinds of nonverbal communication improves both the sending and receiving of messages (Burke, 2005; Weinberg and Gould, 2003; Yukelson, 1998). Nonverbal messages are less likely to be under conscious control, and therefore they are harder to hide than verbal messages. They can give away our unconscious feelings and attitudes. People tend to believe in nonverbal messages. Although nonverbal messages can be powerful, they are often difficult to interpret accurately. Thus, we have to try to correctly judge the context (Weinberg and Gould, 2003). Nonverbal communication related to nonverbal intelligence, time, space and figures include physical appearance, posture, gestures, body position, touching, facial expression and voice characteristics. Like in all the various fields

of our everyday life, nonverbal communication also plays a role of critical importance in the world of soccer (Cabrini, 1999). In addition, Nonverbal problem solving skills seem important to create and exploit the space, and vision in soccer.

Figures in TONI-2 items contain one or more of the following characteristics: shape, position, direction, rotation, contiguity, shading, size, length, movement, and figured pattern (Brown, Sherbenou and Johnsen, 1990). All of these characteristics could be very important in soccer. For example, shape of a player and a team using physical, technical, tactical and psychological elements of the game against their opponents might be very important to be successful. Similarly, positions, directions, rotations, contiguity, shading, size, length, movement and figured patterns seem as vital elements of a successful play in soccer. Soccer involves changing the directions, positions and rotations all the time between defense and offense with the ball and without the ball, and quality (e.g., taking a good shot at goal or heading) and quantity (e.g., a number of correct passes and ball stealing) of movements and patterns of figures determine the successful results.

One or more of the following rules are used in each TONI-2 item: simple matching, analogies (matching and addition, subtraction, alternation, progression), classifications, interactions, and progressions (Brown, Sherbenou and Johnsen, 1990). These problem solving rules and patterns given above might be applicable in sports in general, and soccer in particular. For example, combining one player's own skill with the other team players, using appropriate individual, group and team tactics, and creating the space as an individual, as a group or as a team, to the contrary narrowing the space for the opponents. A soccer player successfully comes out of a crowded and tight marked area uses a kind of nonverbal problem solving skills, which are defined in TONI-2. TONI-2 is a highly standardized, psychometrically sound, norm referenced intelligence test with an administration and response format that eliminates language and reduces motoric and cultural factors (Brown, Sherbenou and Johnsen, 1990; Miles, Graham and Watson, 1990; Kaplan, 1998).

Konter (2007) analyzed the perception of leadership power and found that: a) female athletes have higher perception of expert power than male athletes; b) male coaches have higher legitimate power and referent power than female coaches. Previous research findings showed that: a) boys play competitive games more frequently than girls, b) girls play in predominantly male groups more often than boys play games in predominantly female groups, c) when boys are with friends, they play in larger groups than girls do, d) girls' games are more spontaneous, imaginative, and freer of structure than boys' games, e) boys see themselves more skillful than girls, even though gender differences in actual skill levels are small or nonexistent, f) boy's games are more aggressive, involve taking gender risks, and reward individual achievement to a greater extent than do girls' games, g) boys play games that are more complex than the games girls play; they have more rules, a greater number of different positions (roles), and more interdependence (teamwork) (Coakley, 1997; Weinberg and Gould, 2003). In addition, a) females set goals more often and found them to be more effective than males did (except for outcome goals), b) success and failure have high informational value in competition, and males exhibited significantly higher levels of intrinsic motivation after success than after failure, c) females did not vary much across success and failure conditions, which suggests that competitive success is more important for males than for females, d) females appear less threatened by the information contained in competitive failure, likely because their egos are not typically as invested in displaying success as are those of their male counterparts (Weinberg and Gould, 2003). Moreover, results of meta-analysis on gender differences indicated that; a) men hold more power than women b) gender is shaped by social, cultural, and societal influences c) there are more similarities than differences, d) diversity of women's experiences should be recognized and celebrated (Etaugh and Bridges, 2001).

Females are given more negative assessments and comments compared to males related to their sport and motor abilities. As a result, females give less importance to their sport skills; they feel that they have better skills in different academic fields than sports. In contrast, males give more importance to their sport skills; they feel more confident and more skillful in motor skill and sports than females. Parents see their female children less skillfully than their male children, they give more opportunities to their male children, teachers assess males more skillful than females in sports although they do not give much importance about gender differences related to reading and math, males are given more praises than female in their sport success (Eccles and Harold, 1991, Eccles, 1987 and 1985). It is obviously expected that level of nonverbal intelligence increase with the level of education increase from primary school to high school aged 13 to 17 (Brown, Sherbenou and Johnsen, 1990). However, there is no research related to gender, age, educational level and nonverbal intelligence in soccer.

Soccer is the most popular sport in the world and becomes a more international and cross-cultural sport activity involving millions of people and is a multi billion dollar business (Allcorn, 1997; Maças, Claudino, Serodio-Fernandes, & Sampaio, 2007). Management of players, coaches, teams, administrators and other related supporting staff (for instance; sport psychologist, athletic trainer etc.) become of great importance in order to obtain desired results, success, performance and satisfaction. It also seems very important and privilege to have and to educate intelligent players according to different age groups, gender and educational levels for most soccer clubs. In addition, TONI-2 would be of value to sport educators, sport management and especially to sport psychology studies, because it could provide information about a team's and its players' nonverbal intelligent patterns in connection with gender, age groups and educational levels in soccer. Therefore, this study involved an exploration of nonverbal intelligence of soccer players according to their age, gender and their educational level.

## **2. Method**

### *2.1. Participants*

Data were collected from 353 soccer players (312 male, 41 female) aged 13 to 17. The soccer players had a mean age of  $14.78 \pm 1.41$  years and played for A youth (17 years olds), B youth (15-16 years olds) and C youth (13-14 years olds) levels soccer.

### *2.2. Instrumentation*

Original TONI-2 was described by its authors as a language-free measure of cognitive ability and can be given to persons who range in age from 5-0 to 85-11 years. TONI-2 contains 55 items arranged in order of difficulty. This is an untimed test which requires 15 minutes to complete. To determine the test, one simply pantomimes the instructions; no reading, writing, listening and speaking is involved on the part of the administrator or subject. The subject simply points to the appropriate response. Original TONI-2 has multiple choice items (Brown, Sherbenou and Johnsen, 1990).

Demographic characteristics of the original TONI-2 include different age, gender, race, ethnicity, geographic region of residence, domicile, educational attainment of parents and adult subjects, and special population groups (Brown, Sherbenou and Johnsen, 1990).

Internal consistency reliability of the original TONI-2 differs between .81 and .98 according to different age groups. In addition, test-retest with alternate form reliability coefficients ranges between .80 and .95. Moreover, reliability of the original TONI-2 with special populations changes between .67 and .92. Test validity of the original TONI-2 consists of correlations with achievement (.81), aptitude and general intelligence (.80) (Brown, Sherbenou and Johnsen, 1990). TONI-2 has recently been adapted to soccer players in Turkey (Konter and Yurdabakan, 2010) and revealed internal consistency reliability .72 and test-retest reliability .83 for 13-17 years old soccer players.

### *2.3. Data Collection*

Head coaches for soccer clubs were contacted and the nature of the research project was explained. The coaches were informed that the research involved soccer players' nonverbal perceptions related to soccer. After the coaches and soccer players consented to participate in the research, a meeting time and place for testing sessions was determined. TONI-2 forms with brief instructions were then administered to players.

### *2.4. Data Analysis*

One way ANOVA was applied for the age groups 13 to 17 years olds. Then multiple comparisons were made for significant differences. In addition, t-test was computed for gender and educational levels of soccer players.

## **3. Results**

ANOVA results of TONI-2 according to the players aged 13-17 years in soccer were presented in Table 1.

**Table 1. Anova results of TONI-2 according to the players aged 13-17 years in soccer**

Age	n	Mean	SD	Source of variance	SS	Df	MS	F	p	D
13	86	10.88	43	Between groups	622.79	4	155.70	6.32	.000	.27
14	80	11.75	48	Within groups	8523.37	346	24.63			
15	64	11.92	74	Total	9146.16	350				
16	66	14.30	73							
17	55	13.98	64							
Total	351	12.40	11							

Results of mean  $\pm$  standard deviation values of the TONI-2 according to the players aged 13-17 range between  $10.88 \pm 4.43$  and  $14.30 \pm 5.73$ . ANOVA results indicated the meaningful differences according to age groups related TONI-2 ( $p < .01$ ). Table 1 also presents the moderate results of effect size ( $\eta = .27$ ) of age groups related to nonverbal intelligence in soccer (Cohen, 1987). Further, results of post hoc analysis are presented in Table 2.

**Table 2. Multiple comparisons of mean differences according to the 13-17 years in soccer**

(I) Age	(J) Age	Mean Difference (I-J)	Se	P
13	16	-3.42	.81	.000
	17	-3.10	.86	.000
14	16	-2.55	.83	.002
	17	-2.23	.87	.011
15	16	-2.38	.87	.007
	17	-2.06	.91	.025

Multiple comparisons of mean differences according to the 13-17 years aged players in soccer related to TONI-2 showed that older players (16 and 17 years olds) have higher TONI-2 scores than the younger ones (13, 14 and 15 years olds). In other words, TONI-2 points increased with the age from 13 through 17 in order.

Results of comparisons between male and female, secondary and high school soccer players are given in Table 3.

**Table 3. Results of t-statistics of TONI-2 according to gender and educational level**

Groups	N	Mean	SD	df	t	p	ES
Male	312	12.04	4.91	351	-3.49	.001	.54
Female	41	14.95	5.88				
Secondary School	186	11.16	4.36	333	-5.20	.001	.56
High School	149	13.93	5.41				

Comparisons of male and female, secondary and high school soccer players revealed meaningful differences ( $p < .01$ ). Means indicate that female soccer players have higher points of TONI-2 than male soccer players. Similarly, high school soccer players have higher TONI-2 points than secondary school soccer players. Table 3 also presents the moderate results of effect size for gender ( $ES = .54$ ) and educational levels ( $ES = .56$ ) of soccer players related to their nonverbal intelligence.

#### 4. Discussion

The analyses described above suggest that; a) older players (16 and 17 years olds) have higher TONI-2 scores than the younger ones (13, 14 and 15 years olds). In other words, TONI-2 points increased with the age from 13 through 17 in order, b) female soccer players have higher points of TONI-2 than male soccer players, c) high school soccer players have higher TONI-2 points than secondary school soccer players.



In general, positive results indicated, above might be an important contribution to the TONI-2 which included different age groups, gender and educational levels including gifted elementary and secondary school children. There is no doubt that physical education teachers, managers, coaches and club administrators look for intelligent players, educate and give them training to have successful results. Therefore, apart from observations and arbitrary selection procedures, athletes in general and soccer players in particular need sound assessment tools related to different kind of intelligence, especially nonverbal intelligence, which plays an important role in soccer performance.

Nonverbal intelligence measured by TONI-2 (Brown, Sherbenou and Johnsen, 1990) indicated that the older the age groups of people, the higher their score of TONI-2. For example, 5-7, 8-9, 10-12, 13-17, 18-20 and, 21 and over. The results of present study indicated the supporting results, particularly with the age group of 13 to 17. These results also indicated moderate level of effect size. In other words, Turkish TONI-2 showed that the older the age, the higher the points of TONI-2 from 13 to 17 years.

The present research showed that female soccer players have higher points of TONI-2 than male soccer players. These results also indicated moderate level of effect size. Gender differences exist in nonverbal intelligence. On the one hand, this result does not support the socialization reasons as some authors put forward (Coakley, 1997; Weinberg and Gould, 2003). For example; a) boys play competitive games more frequently than girls, b) girls play in predominantly male groups more often than boys play games in predominantly female groups, c) when boys are with friends, they play in larger groups than girls do, d) boys see themselves more skillful, even though gender differences in actual skill levels are small or nonexistent, e) boys play games that are more complex than the games girls play; they have more rules, a greater number of different positions (roles), and more interdependence (teamwork). On the other hand, the result of the present study seen to support the findings such as, a) girls' games are more spontaneous, imaginative, and freer of structure than boys' games (Coakley, 1997; Weinberg and Gould, 2003). However, there is not much research related to gender and TONI-2 to make more certain conclusions.

TONI-2 scores increase with the level of education from primary school to high school (Brown, Sherbenou and Johnsen, 1990). The present research also confirmed this result and showed that soccer players graduated from high school have higher points of TONI-2 than soccer players graduated from secondary school. These results also indicated moderate level of effect size. Therefore, all these results obtained from the data (Table 1, 2 and 3) seem to support the further validity of the Turkish TONI-2 (Konter and Yurdabakan, 2009), which have a parallel results of the original TONI-2 (Brown, Sherbenou and Johnsen, 1990). It is obviously expected that; the higher the educational level is, the older the soccer players are. In other words, age increase with level of education. Therefore, future researchers take into account the both of variables to have more reliable results.

Future research attempts could also take into consideration different performance measures related to nonverbal intelligence. For example, physical (strength, speed, endurance, balance, flexibility, coordination, power etc.), technical (controlling the ball, passing, shooting, heading etc.), tactical (crating space as an individual, group or team, crossovers etc.) and psychological (imagery, coping with stress, concentration, goal setting, self talk, self confidence, motivation etc.) performance measures as regard to a specific sport. In addition, future research efforts could focus on the standardization process of the Turkish TONI-2 for soccer players with different age groups. Moreover, Turkish TONI-2 could be applied to the different sport populations including individual and team sports, gender, age and educational levels. Finally, managers, coaches, and other related sport stuff, even spectators could be taken into consideration as regard to the application of TONI-2 related to gender, age and level of education.

Fisher (1984) indicated that individuals preparing to be coaches ought to begin immediately to strengthen their backgrounds to deal with these cognitive factors and be ready to assist their future athletes to develop the potential of their sport intelligence. Therefore, TONI-2 could be a starting point to obtain more information about nonverbal intelligence including gender, age groups and educational levels of players in soccer.

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