

Validity and Reliability of the Test of Nonverbal Intelligence-2 for Soccer Players in Turkey

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Abstract. The purpose of this study was to investigate validity and reliability of the Test of Nonverbal Intelligence-2 (TONI-2: Brown, Sherbenou and Johnsen, 1990) for soccer in Turkey. For this reason, data were collected from 618 soccer players (544 male; 74 female). The male soccer players had a mean age of 16.66 years and had been playing for an average of 5.63 years with an official soccer license. The female players had a mean age of 17.12 years and had been playing soccer for an average of 3.20 years with an official soccer license. In the analyses, the same way was followed as original TONI-2. Therefore, item discrimination and item difficulty indices for item analysis and internal consistency and test-retest reliability for total scale of TONI-2 were calculated according to different age groups in this research. In addition, a number of different groups were compared for validity using the Turkish TONI-2 data including age of participants, substitutes and non-substitutes, professionals and amateurs, central and peripheral playing positions and educational level of players. Results of the study revealed that item difficulty means range between 0.30 and 0.32, minimum and maximum values of item discriminations change between .-17 and .74, internal consistency (KR-20) values of the players aged 10-12, 13-17, 18-20, and 21 and over alternate from .72 to .75, and test-retest reliability values vary between .73 and .87. In addition, criterion validity according to different groups was analyzed by using ANOVA and t statistics. Results indicated the meaningful differences according to age groups. Older players have higher TONI-2 scores than the younger ones. Multiple comparisons showed that no substitute players from substitutes, professional players from amateurs, high school players from secondary school players and central players from peripheral ones have higher points in Turkish TONI-2.

Keywords: Nonverbal Intelligence, Soccer, Adaptation, Validity, Reliability.

1. Introduction

The recent discovery of clues as to where the seat of intelligence may lie in the brain, in the lateral frontal cortex, is just part of a rapid expansion in our understanding of the nature and workings of various forms of intelligence. However, intelligence without curiosity is sterile. The combination led Homo Sapiens to try to understand the world around him, to develop tools and strategies for achieving greater control, and to experiment and continuously improve the resulting technologies and skills [15].

In the late 1960's and early 1970's, personality testing of athletes was the popular pastime of individuals who called themselves sport psychologists for the purpose of delineating a number of descriptive traits. Intelligence was included among the myriad of personality traits measured, although few conclusions about athletes' intelligence levels were drawn from this line of research [22]. Therefore, in the 1980s, researchers began to draw more attention to different paradigms and methods, which could probably better account for intelligent behavior related to skilled motor performance. In essence, intelligence is a complex cognitive construct, particularly when applied to a specific field such as athletic performance. In the early 1990s, research in this area was in its relative infancy; therefore, as in the case of personality research, the exact nature of the relationship between intellectual capabilities and motor behavior and performance was still

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quite unclear [66].

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 [22].

In Alfred Binet's time (circa 1900), intelligence and intelligence testing popularized with mentally retarded and normal children relative to school progress, understanding their language and ability to reason verbally and nonverbally. The current Stanford-Binet intelligence test can be traced back to the early work of Binet related to academic intelligence, which is the ability to deal with verbal and quantitative matters. Following Alfred Binet, Spearman [64] raised the general (*g*) and specificity (*s*) factors of intelligence. The *g* factor of intelligence was supposedly common to all other intelligence tests, whereas the *s* factor was unique to a specific test [22]. Following these advancements, researchers started to delineate specific aspects of intelligence. For example, Gardner [25] viewed intelligence as composed of seven multiple abilities and labeled them as linguistic, logical-mathematical, spatial, musical, kinesthetic, interpersonal and intrapersonal.

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 [22]. Therefore, it seems that nonverbal intelligence in particular is related to perception and attention. One's perceptual style, certainly an intelligence variable, is directly responsible for the quantity and quality of behavior that is exhibited. Some characteristics of this style are the way a person (a) transforms and codes environmental stimuli, (b) attends to some stimuli while neglecting other, (c) uses stimuli to form the internal representation of the external world, (d) symbolizes events in space and time, and (e) organizes, initiates, and controls movements [44]. Evidence of this fact occurs when a potential pass receiver in football attempts to run before the ball is caught. In this situation, either the encoding of the pass reception is not represented in memory adequately enough or the accessing is out of sequence. No matter what the case is, the end result is poor performance mediated by a lack of intelligence, but this is not to be confused with academic intelligence [22]. Tenenbaum and Bar-Eli [66] 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, sensorimotor processing, attention, anticipation, cognitive styles, and time and space perception. These all seem to be related to nonverbal intelligence in sport.

Intelligence is an interactional construct based on individuals' capacities to handle specific environmental demands. Few people are necessarily intelligent in all situations. If this assertion seems reasonable, then it points us clearly in the direction of a task demands approach if we are to understand sport intelligence [22]. For example, what is it that players have to do to be successful in soccer? What specific kinds of intelligence do they need in offense and defense situations, central and peripheral positions? How can soccer players be assisted with their intelligence development (particularly nonverbal intelligence)?

Naming and locating features of the environment, searching and detecting task relevant cues, identifying cue patterns, short and long term memory recalls, and decision making process seem to be necessary factors related to nonverbal intelligence that soccer players face in their environments. For example, soccer players must have enough knowledge about the task to know from where the important cues are derived, understand the basic nature of their task, select relevant cues and filter out disturbances and eventually make their movement decisions. Awareness of the complexities of the demands placed upon soccer players and the role of cognitive mediators on soccer performance could also be related to soccer players' cognitive styles. Certain cognitive styles may reflect strategy differences, which are manifestations of athletes' intelligence [28, 42, 50]. More research is needed regarding how intelligence in general and nonverbal intelligence in particular is involved in sport and more specifically in soccer, when and why they operate in sports settings.

Limited number of studies in sport related intelligence concentrated on: academic performance of varsity athletes and their intelligence [56], group intelligence, group placement, physical efficiency and performance [48, 65], mental functions, athletic ability, personality problems, affectivity and intelligence [24], ability to learn sport-type gross bodily motor ability and the effect of intelligence on motor learning and performance of motor skills [7], power and mental ability of nonathletes' and athletes' participation in different sports [10], mental ability and skill in badminton and tennis [67], conceptual symbol identification, physical ability,

intelligence in hockey and gymnastics [49], physical exercises, performance, successful orientation, expectations of achievement [58], personality factors, high-achievers and low-achievers in tennis and badminton [11], superior intellectual functioning, peak performance and intellectual excellence [55], intellectual abilities, technical competence, experience and effective team performance in basketball [21], heredity, well-being, physical attributes, personality characteristics, information processing capabilities, and intelligence [62], psychological characteristics of Olympic champions, coping with and controlling anxiety; confidence; mental toughness/resiliency; sport intelligence [26], influence of intelligence in the terminal phases of information processing and motor programming [2].

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 [60]. Bjurwill [5] discusses 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. Beswick [4] also emphasized the role of emotional intelligence related to self-control in soccer. Self-control, then, requires the intelligence to manage yourself and those around you in emotionally charged situations.

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. More research is needed regarding how different types of intelligence (particularly nonverbal intelligence) are involved in sports and more specifically in soccer, when, how and why they operate in sports settings. Test of Nonverbal Intelligence-2 (TONI-2) was built as a language free and culture reduced test, which might fill this void [8] and could be used in sport settings and various cultures.

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 to 85 years. TONI-2 contains 55 items arranged in order of difficulty. 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. This is an untimed test, which requires 15 minutes to complete [8].

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 in the manual [8].

Demographic characteristics of the original TONI-2 include different age (5 to 85 years old, $n=2764$), gender (male % 47 and female % 53 of the population), race (Caucasoid, Negroid and Mongoloid), ethnicity (Anglo/European, Black American, Hispanic, Oriental/Pacific Islander, Native American/Eskimo/Aleut, and others), geographic region of residence (Northeast, North Central, South, West), domicile (Urban, Suburban, and Rural), educational attainment of parents and adult subjects (Completed 0-11 Grades, Completed High School, Attended College or Technical School, Graduated College, Completed Post Graduate Training), and special population groups (Mentally Retarded, Learning Disabled, Dyslexic, Head Injured, Deaf, Gifted-Secondary, Gifted-Elementary, Spanish Speaking/Mexico and Chile, Bilingual/Faculty English Proficient, Limited English Proficient, Non English Proficient) [8]. TONI-2 seems appropriate to be used in different gender, race, and ethnicity, geographic region of residence, domicile, educational levels, special populations and cultures. Therefore, TONI-2 could also be adapted and used in sport settings including talented players.

In general, a number of studies have used and supported Brown, Sherbenou and Johnsen's [8] TONI-2. For example, undergraduate students and concurrent validity [16, 45], cultural differences and cultural bias [32, 47], children with hearing impairments and deaf [13, 39], autism [20], Parkinson patients [6], gang membership, self-esteem, family relations, and learning disabilities [23].

A number of researches in sports concentrated on playing positions (e.g. central and peripheral positions, defense, offense, midfield, positions perceived important and less important etc.) in connection with discrimination, minorities, blacks and whites. For example; kicker position in American football and pitcher

position in baseball [3, 30, 31, 38, 54], whites, blacks, positions and discrimination [53], central positions, offence and guard-shots in basketball [37], coaches' preferences for central positions in soccer [41], economic income and discrimination in baseball [46], race distribution, economic income, central and peripheral positions [63]. In addition, some other researches in sport took up the topics related to goal orientation, personality characteristics, leadership, psychological skills and playing positions. For example, ego and task orientation in football [17], central and no central positions, ball deception and using set plays (for instance; throwing, corner kicks etc.) in soccer [52], personality characteristics and playing positions in team sports including soccer [34, 61], interactional positions and leadership [14, 27, 36, 68], psychological skills and playing positions in soccer [35]. However, there is a paucity of research as regard to playing positions and nonverbal intelligence in sports (the present study concentrates on the playing positions and TONI-2 as regard to validity in method and discussion sections).

Football is the world's most popular form of sport, being played in every nation without exception [57]. 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 this type of communication is also critical to imparting and receiving information [70]. 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 [9, 70, 71]. 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 [70]. 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 [12]. As far as nonverbal codes are concerned, particular attention should be focused on iconic codes, characterizing the language of fixed or moving images and pictorial representations. Other nonverbal codes are directly connected to human and animal gestures [12]. The message is not a unique signal, but a combination of contents interlaced together. Different codes often combine together in one single communication unit: words, gestures, facial expressions, and body positions towards one's interlocutor. Body contact is another nonverbal element whereby players can communicate messages to their opponents. Nonverbal communication also helps to suggest the player's personal disposition and approach to soccer [12].

The basis of all the TONI-2 items is problem solving and the content is abstract/figural [8], which might be useful in soccer where performance is influenced by ongoing struggle of abstract/figural problem solving. Brown, Sherbenou and Johnsen [8] indicated abstract/figural problem solving as the core of the TONI-2 for three reasons; (1) problem solving appears to be a general component or construct of intelligent behavior, (2) the problem solving process and the abstract/figural content both lend themselves readily to the nonverbal, motor reduces testing format, and (3) abstract/figural content ensures that test items are free of language and cultural indicators. In addition, Gifted-Secondary, Gifted-Elementary, Spanish Speaking/Mexico and Chile, Bilingual/Faculty English Proficient, Limited English Proficient, Non English Proficient) were used in the development process of the TONI-2 [8]. All these reason make soccer interesting as a nonverbal problem solving team sport and TONI-2 to be used in another culture.

It has long been accepted that the skill of the team game player lies not only in the possession of technical ability but also the ability to make quick and accurate decisions. Good decision-making is thought to be at least as important as good technique. These decisions must be made while the player is engaged in physical activity, often stressful physical activity [51]. Soccer matches are won by exploiting space. On many occasions this means first creating the space to exploit. Space can be created either by individual player or combined play between two or more players [29]. The first step in understanding the game of soccer is to understand what space is and its importance. Good soccer teams use spaces to keep the ball, to advance it, and ultimately, to score [43]. Simple things make a difference. In soccer, two of the most

important elements of a successful offense require either skill or tactical sophistication-staying spread out and having a good vision. There is nothing as simple, yet more important to the success of a soccer team, than good vision. By vision we mean the personal habit of constantly scrutinizing the soccer field to get the big picture. Soccer players should look over the entire field approximately every five seconds. They should note the best place for the ball (usually an area of space) and the location of nearby passing opportunities. On defense, players should check the space behind them and plan what to do when they get the ball. Players with vision are distinguished by their apparent ability to perceive events before they happen, and by their ability to influence the play by appropriately redistributing the ball. Players with vision are a prerequisite for implementing a system of total football [43]. Therefore, 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. For the most part, the more difficult items contain several of these characteristics while easier items contain only one or two [8]. 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.

Item difficulty also is increased by manipulating the type and number of problem solving rules that must be applied in order to arrive at a solution in TONI-2. Subjects must examine each item, focusing on differences and similarities among the figures in TONI-2. They must identify the rule or rules that are operating among the figures, and following the appropriate rules, select the correct response alternative in TONI-2. 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 [8]. 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 [8, 47, 32]. 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 [1, 40]. International and cross cultural 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 for most soccer clubs. TONI-2 would be of value to 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 perception, cognition and behavior in soccer.

Therefore, this study involved an exploration of validity and reliability of TONI-2 related to soccer for Turkey. Because researchers had yet to empirically examine the nonverbal intelligence in sport (especially in soccer), specific hypotheses were not suggested. In order to understand the nonverbal intelligence in soccer in Turkey and to frame related research questions, validity and reliability were necessary first steps.

2. Method

2.1. Participants

Data were collected from 618 soccer players (544 male; 430 amateur and 114 professional, and 74 female; no professional female soccer league exists in Turkey). The male soccer players had a mean age of 16.66 years. (SD=4.64) and had been playing for an average of 5.63 years with an official soccer license (SD=4.51). The female players had a mean age of 17.12 years. (SD=3.61) and had been playing soccer for an average of 3.20 years with an official soccer license. (SD=3.37).

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 (some items have 6 and some items have 4 options (only the items 15, 19, 26, 28, 40, 41, 45, and 47 have 4 multiple choice and rest of the items 6) [8].

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Demographic characteristics of the original TONI-2 include different age (5 to 85 years olds, $n=2764$), gender (male % 47 and female % 53 of the population), race (Caucasoid, Negroid and Mongoloid), ethnicity (Anglo/European, Black American, Hispanic, Oriental/Pacific Islander, Native American/Eskimo/Aleut, and others), geographic region of residence (Northeast, North Central, South, West), domicile (Urban, Suburban, and Rural), educational attainment of parents and adult subjects (Completed 0-11 Grades, Completed High School, Attended College or Technical School, Graduated College, Completed Post Graduate Training), and special population groups (Mentally Retarded, Learning Disabled, Dyslexic, Head Injured, Deaf, Gifted-Secondary, Gifted-Elementary, Spanish Speaking/Mexico and Chile, Bilingual/Faculty English Proficient, Limited English Proficient, Non English Proficient) [8].

Psychometric analyses of the Original TONI-2 include item analysis (item difficulty and discrimination), test reliability (internal consistency, test-retest with alternate form and reliability with special populations) and test validity (content validity, criterion related validity, construct validity, correlations with chronological age, measures of achievement, aptitude and general intelligence) [8].

Item discrimination and item difficulty indices of the original TONI-2 were computed according to different age groups. Item discrimination coefficients range between .37 and .81, and item difficulty percentages change between .06 and .62 in the original TONI-2. Internal consistency reliability of the original TONI-2 also differs between .81 and .98 according to different age groups. In addition, test-retest with alternate form reliability coefficients range between .80 and .95. Moreover, reliability of the original TONI-2 with special populations (aforementioned) changes between .67 and .92 [8].

Test validity of the original TONI-2 consists of correlations with chronological age, measures of achievement, aptitude and general intelligence. Correlation between chronological age and row scores of the original TONI-2 is .38. In addition, measures of achievement between original TONI-2 and various achievement measures (for example; reading, writing, science, math, language arts, social studies etc.) differ between .14 and .81. Moreover, correlations between the original TONI-2 and various measures of aptitude and general intelligence resulted between .15 and .80 [8].

2.3. Procedures

The authors of the TONI-2 were contacted for permission to do the cultural validity and reliability study (personal communication with Susan Johnson for permission to use the TONI-2). There was no need for language validity as TONI-2 has nonverbal procedures [8].

2.4. 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. At the testing session, players briefly were given information about the research project and they were encouraged to answer the TONI-2 honestly. They were also informed that their answers would only be used for research purposes and kept confidential. TONI-2 forms with brief instructions were then administered to players. TONI-2 also had some demographic questions to collect information about participants' ages, gender, sport, years of experience, level of play, educational level etc. Completion of each TONI-2 form required approximately 15-20 minutes. For the test-retest results, "TONI-2 A Form" was applied twice ($n=142$), three weeks after the first administration.

2.5. Data Analysis

In general, the same way was followed as original analysis of TONI-2 [8]. Therefore, item discrimination and item difficulty indices for item analysis and internal consistency and test-retest reliability for total scale of TONI-2 were calculated according to different age groups in this research. In addition, differences between age of participants (13-17 age groups), substitute and non-substitute players, professional and amateur players, educational levels (primary school, secondary school, high school and university) of players, central and peripheral playing positions of the players aged 18 and over, and raw scores of the TONI-2 (criterion validity according to different groups) were analyzed for validity [18, 33].

3. Results

Results of item analysis, internal consistency and test-retest reliability of the TONI-2 according to different age groups for soccer players in Turkey were presented in Table 1.

Table 1. Results of Item analysis, Internal Consistency and Test-Retest Reliability of the TONI-2 According to Different Age Groups for Soccer Players in Turkey.

Ages	N	Item Difficulty			Item Discrimination			KR-20	Test-Retest
		Min.	Mean	Max	Min.	Mean	Max		
10-12	70	.06	.31	.86	-.17	.27	.65	.73	.81
13-17	348	.03	.30	.73	.02	.28	.55	.72	.83
18-20	103	.08	.32	.79	-.10	.31	.66	.75	.87
21 +	96	.06	.30	.79	.09	.33	.74	.74	.73

Table 1 presents the results of item difficulty, item discrimination, internal consistency reliability (KR-20) and test-retest reliability of the Turkish TONI-2. In general, item difficulty means of the Turkish TONI-2 change between 0.30 and 0.32. In addition, minimum and maximum item difficulty values of the players aged 10-12, 13-17, 18-20, and 21 and over range between .03 and .86. Item discrimination minimum and maximum values of the players aged 10-12, 13-17, 18-20, 21 and over change between -.17 and .74. Internal consistency (KR-20) values of the players aged 10-12, 13-17, 18-20, and 21 and over change between .72 and .75. Moreover, test-retest reliability range between .73 and .87. Overall, all these results relatively indicate satisfactory results to measure intended test.

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

Table 2. 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-value
13	86	10.88	4.43	Between groups	622.79	4	155.70	6.32	.000
14	80	11.75	4.48	Within groups	8523.37	346	24.63		
15	64	11.92	4.74	Total	9146.16	350			
16	66	14.30	5.73						
17	55	13.98	5.64						
Total	351	12.40	5.11						

Results of mean \pm standard deviation values of the TONI-2 according to the players aged 13-17 range between 10.88 ± 4.43 and 14.30 ± 5.73 . ANOVA results indicated the meaningful differences according to age groups related TONI-2 ($p < .01$). Further, results of post hoc analysis are presented in Table 3.

Table 3. Multiple Comparisons of Mean Differences According to the 13-17 Years Aged Players in Soccer Related to TONI-2.

(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 have higher TONI-2 scores than the younger ones. In other words, TONI-2 points increased with the age from 13 through 17 in order.

Comparisons of Substitute-Nonsubstitutue, Amateur-Professional, Secondary-High School and Central-Peripheral soccer players for validity are given in Table 4.

Table 4. Statistics of TONI-2 According to Substitute-Nonsubstitutue, Amateur-Professional, Secondary-High School Education and Central-Peripheral Player Positions in Soccer for Validity.

Groups	N	Mean	SD	df	t	p-value
Nonsubstitute	221	12,85	5,14	346	1.90	.048
Substitute	127	11,77	4,97			
Amateur	306	12.04	4.93	349	3.49	.001
Professional	45	14.84	5.66			
Secondary School	186	11.16	4.36	333	-5.20	.000
High School	149	13.93	5.41			
Central	83	11.94	4.96	98	2.09	.04
Peripheral	17	9.24	4.37			

Comparisons of Substitute-Nonsubstitutue ($p<.05$), Amateur-Professional ($p<.01$) Secondary-High School ($p<.01$) and Central-Peripheral ($p<.05$) soccer players for validity revealed meaningful differences. Nonsubstitute players from substitutes, professional players from amateurs, high school players from secondary school players and central players from peripheral ones have higher points in TONI-2 related to soccer.

4. Discussion

The analyses described above suggest that TONI-2 [8] is fit with the data collected in Turkey (Tables 1, 2, 3 and 4).

Reliability analysis for internal consistency yielded similar results with the original TONI-2 (Table 1). Cronbach's alphas of the original TONI-2 range between 0.81 and 0.98 [8], and Cronbach's alphas of the Turkish TONI-2 change between 0.72 and 0.75. In addition, analysis of item difficulty indicated parallel results with the original TONI-2. Item difficulty results of the original TONI-2 range between 0.06 and 0.62 [8], and item difficulty results of the Turkish TONI-2 change between 0.03 and 0.86. Moreover, analysis of item discrimination showed supporting similar results with the original TONI-2. Item discrimination results of the original TONI-2 range between 0.37 and 0.81 [8], and item discrimination results of the Turkish TONI-2 change between -0.17 and 0.74. However, negative item discrimination results of the TONI-2 (for example; -0.17) suggest that some items are very difficult for children (especially towards the last items of the TONI-2 from 40 to 55).

Test-retest reliability analysis also revealed similar results with the original TONI-2. Test-retest reliability results of the original "TONI-2 with Alternate B Form" range between 0.80 and 0.95 (results with special populations including gifted ones are between 0.67 and 0.92). However, test-retest reliability results of the "Turkish TONI-2 with the Same A Form" (applied three weeks after the first administration) change between 0.73 and 0.87 (Table 1).

Different results might stem from different samples. Original TONI-2 data was collected from 5 to 85 years olds including different race, ethnicity, geographic region of residence, domicile, educational attainment of parents and adult subjects, and special population groups (Mentally Retarded, Learning Disabled, Dyslexic, Head Injured, Deaf, Gifted-Secondary, Gifted-Elementary, Spanish Speaking/Mexico and Chile, Bilingual/Faculty English Proficient, Limited English Proficient, Non English Proficient) [8], while the Turkish TONI-2 data was collected from amateur and professional soccer players aged 10 to 21. In general, positive results indicated above might be an important contribution to the TONI-2 which included 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.

A number of "criterion validity" findings according to different groups [18, 33] of the Turkish TONI-2 data also indicated supporting results (Table 4): Firstly, comparisons of different age groups from 13 to 17

revealed meaningful differences. Results showed that, the older the soccer players are the higher their points of TONI-2. In other words, TONI-2 points increase with the age from 13 through 17 in order. These results supported the original TONI-2 which showed that the older the age, the higher the points of TONI-2. Secondly, substitute and nonsubstitute players were compared. It was found that nonsubstitute soccer players have higher points than the substitute soccer player. This result indicates that nonverbal intelligence seems important to be a starter in the team rather than being a substitute player. Thirdly, comparisons of amateur and professional players indicated that professional soccer players have higher points than the amateur players. This outcome suggests that nonverbal intelligence plays an important part in being a professional soccer player as compared with amateur soccer players. Fourthly, soccer players were compared according to their educational levels. Results showed that soccer players graduated from high school have higher points than soccer players graduated from secondary school. This result points out that soccer players with higher educational level have higher TONI-2 points and education appears to be important related to nonverbal intelligence. These results also supported the original TONI-2. Finally, soccer players playing in central positions compared with the players in peripheral positions. Results revealed that central position players have higher points than the peripheral position players. A player's personality influences the way he or she tends to perceive things, perceptual style is claimed to be important in that some people are more sophisticated perceivers than others. So-called field independent individuals have excellent vision (in the sense that a good midfielder is said to have good vision). They are the ones who tend to "ride" the tackles and stay out of trouble. Field dependent types (for example; wingers or peripheral players on the soccer field) cannot easily focus on relevant visual information [59]. This result might indicate that central position players have higher demands than peripheral positions related nonverbal problem solving skills as they are visually attending the wider part and both sides of the soccer field. Therefore, all these results obtained from the Turkish TONI-2 (Table 2, 3 and 4) seem to support the validity of the original TONI-2.

Analyses of present study reveal reasonable validity and reliability results and support the original TONI-2 construct. However, more sport and soccer specific factors and items could be designed to measure nonverbal intelligence more specifically in the future. For example items could be organized in offense and defense situations according to real playing positions and decision making processes.

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 (creating 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. Finally, managers, coaches, and other related sport stuff, even spectators could be taken into consideration as regard to the application of TONI-2.

In this study, test-retest reliability was analyzed by the same "TONI-2 A Form". Future researchers could focus on alternate form reliability using original TONI-2 B Form with the Turkish data. In addition, concurrent validity could also be carried out using different intelligence tests by Future researchers.

Test validation should be an on-going project with subsequent attempts and refinement [69]. Duda and Hayashi [19] emphasized that sport and exercise psychologists should develop and employ measures and methods which are relevant to the physical domain and are culturally sensitive, ecologically grounded, and empirically sophisticated. They also reported that the majority of research in sport and exercise psychology had failed to consider individuals of other cultural, racial and socioeconomic groups. However, the possibility of including a sound instrument measuring nonverbal intelligence in sport and exercise psychology studies should help generate a greater number of new and interesting research questions. Fisher [22] 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 leverage to obtain more information about sport related nonverbal intelligence.

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