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DO AGE AND GENDER INFLUENCE MULTIPLE INTELLIGENCES?

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In the theory of multiple intelligences put forth by Howard Gardner, initially, he classified 7 intelligences (logical, linguistic, musical, visual, kinesthetic, interpersonal, and intrapersonal) and later added another 2 (naturalistic, existential). In this study our aim was to explore whether or not there is a correlation between these 9 intelligence types and individuals' age and gender. We used cluster sampling to select participants for the study from students in grades 10, 11 and 12 at 4 high schools in the Famagusta and Iskele Districts, Northern Cyprus. We used the Multiple Intelligences Inventory and performed independent samples *t* test and analysis of variance. We found statistically significant differences for verbal, kinesthetic, existential, musical, interpersonal, intrapersonal, and naturalist intelligences according to gender and statistically significant differences for visual, logical, intrapersonal, naturalist, and existential intelligences according to age.

Keywords: age, gender, high school students, multiple intelligences.

Intelligence has been one of the most interesting areas of research in education and the human brain is still considered as a black box. In the traditional sense, intelligence has generally had the connotation of mathematical-logical intelligence (De Lange, 2012; Van Der Walt & Maree, 2007). After years of work, experimentation, and studies on the human brain and how knowledge is acquired, in 1983, a Harvard psychologist, Howard Gardner, came up with a redefinition of intelligence theory. In the multiple intelligences (MI) theory he differentiated seven types of intelligences as follows: logical-mathematical intelligence, verbal-linguistic intelligence, musical-rhythmic intelligence, visual-spatial intelligence,

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bodily-kinesthetic intelligence, interpersonal intelligence, and intrapersonal intelligence. Since then, throughout the world, the theory of multiple intelligences has been discussed, implemented, and criticized by a number of researchers and scholars.

Gardner defined *intelligence* as "the ability to solve problems or fashion products that are of consequence in a particular cultural setting or community" (1999). He questioned the traditional way of thinking about intelligence and claimed that it is not possible to measure human intelligence by a test full of words, numbers, and shapes (Armstrong, 2003). In his own research – known as Project Zero - Gardner himself, his colleagues, and students worked particularly with children with mental disabilities, with brain-damaged children, and with gifted children. Their findings suggest that any damage to the brain partially limits its use; in other words, a person who lacks the ability to move his/her body is still able to sing, to make friends, or to be competent with numbers or words. The most important characteristics of the theory of multiple intelligences are that only verbal or mathematical abilities of a person limit their capabilities. Thus, MI theory provides a broadened perspective on intelligence, which is more realistic and more holistic than other perspectives (Fogarty & Stoehr, 2008). In a similar vein, Kagan and Kagan (1998) and Popkewitz (2008) asserted that each student possesses a number of independent capacities and each individual student is capable of learning anything provided that he or she is instructed well (Horn, 2009).

Gardner (1999) defined *verbal-linguistic intelligence* as being sensitive to words, being good at learning, and using languages both spoken and written purposefully. In addition, *logical-mathematical intelligence* is about analyzing and solving problems by using mathematical and scientific abilities. Besides these two highly emphasized intelligence types, the focus of *musical-rhythmic intelligence* is the ability to compose and perform various music forms and sensitivity to any kinds of musical pattern. *Visual-spatial intelligence* involves being able to identify spaces and thinking with visual images. *Bodily-kinesthetic intelligence* involves use of the body itself or parts of the body in the process of problem solving. Interpersonal intelligence is having the ability to understand people and empathize with them; and being able to work with others effectively and efficiently. On the other hand, the focus of *intrapersonal intelligence* is on the self and understanding one's own feelings, thoughts, ambitions, worries, abilities, strengths, and weaknesses and using all these to elevate one's way of life. Naturalistic intelligence, which Gardner added to other intelligence types in 1999, is about the awareness of one's surroundings, with the focus on being able to identify and define the species existing around one. Existential intelligence, as philosophical as it sounds, is related to looking for meaning, asking questions, defining values, seeing daily experiences from a different point of view.

One of the most significant characteristics of MI theory is that intelligence can be pluralized (Armstrong, 2000, 2003; Gardner, 2004). In other words, people do not have just one single intelligence; instead, they have all intelligences at varying levels. The dominant intelligence of one person may not be the dominant intelligence of another and the combination of intelligences varies from person to person (Kagan & Kagan, 1998; Viens & Kallenbach, 2004). If the theory of MI is accepted, this leads to the need for the teacher to employ different teaching techniques in order to address the different needs of individual learners. Indeed, Van Der Walt and Maree (2007) drew attention to the significance of using metacognitive strategies while teaching mathematics. They maintain that mathematics is a gateway subject for tertiary education and recommend that teachers of mathematics should employ a variety of metacognitive strategies in order to enhance the success of their instruction in catering to the needs of secondary school students. In line with this reasoning, Horn (2009) pointed out that teaching should be more learner-centered, as opposed to traditional teaching methods. Similarly, Mitchell (2008) and De Lange (2012) highlighted the need for visual teaching methodologies. All these issues related to teaching are put forth in order to enhance the learning of learners, in other words, to improve teaching and, in a similar vein, to cater for the needs of learners with various strategies tailored to the needs of various intelligence combinations.

Throughout the world, the theory of multiple intelligences has been widely adopted. The present research was a case study of the application of an MI inventory, conducted by one of the authors of this paper (Menevis, 2011) with secondary-school students in North Cyprus. Therefore, this study can be considered significantly important, as the aim was to investigate the relationship between the intelligences of high-school students with respect to their age and gender. In the study, we sought to answer the following questions:

a) Are there statistically significant differences between the participants' intelligences according to their gender?
b) Are there statistically significant differences between the participants' intelligences according to their age?

Method

This study was conducted as quantitative research. It was a case study of students in grades 10, 11, and 12 attending state high schools in the Famagusta and Iskele Districts of North Cyprus. We chose to use a cluster sampling strategy because this method is appropriate "in situations where the population members are naturally grouped in units that can be used conveniently as clusters" (Wiersma & Jurs, 2005).

The participants were 517 students (284 girls = 54.9%, 233 boys = 45.1%) at four schools, which were Gazimağusa Türk Maarif College, Namık Kemal High School, Bekirpaşa High School, and Polatpaşa High School. These schools were selected as they are located in two of the six major regions in North Cyprus and, thus, all the students studying in these two districts of the country were involved to represent the population.

The students' ages ranged from 15 to 18 years old. Among the participants, 39 (7.5%) of them were 15 years old, 177 (34.2%) of them were 16, the 201 students (38.9%) who were 17 made up the biggest group, and 100 (19.4%) were 18 years old.

Despite the fact that MI theory is acknowledged in the Northern Cyprus national education system, an MI inventory has not been developed in this context. Thus, initially an MI inventory was developed for the case study (Meneviş, 2011). In order to construct the inventory, the Turkish and English inventories that had previously been developed were examined and the characteristics of the nine intelligences described by Gardner (1983, 1999) were studied. To establish content validity, an item pool was prepared and the least related items were eliminated. In addition, four experts in the field of education and two language experts were approached in order to get their opinion and a 135-item inventory was shaped following exploratory factor analysis. Finally, the Multiple Intelligences Inventory was developed with 93 items covering the nine types of intelligence as categorized by Gardner; logical-mathematical, verbal-linguistic, musical-rhythmic, visual-spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalist, and existential.

Participants in the study were asked to rate the items in the Multiple Intelligences Inventory on a 5-point Likert scale by choosing from the given alternatives the one that was appropriate for them. The alternative responses were *a lot like me*, *like me*, *not sure*, *a little like me*, and *not like me at all*. As the mother tongue of the participants was Turkish, the inventory was prepared in Turkish. After the responses were collected, the PASW 18 statistics program was used to analyze the data. An independent samples *t* test was conducted to check whether or not there was a statistically significant difference in MI with respect to gender and an analysis of variance (ANOVA) was performed in order to explore whether or not there was a statistically significant difference in MI with respect to the age variable.

Results

In Table 1, the independent *t* test results for the intelligences and the gender of the participants are given. The results indicate that the verbal intelligence, kinesthetic intelligence, musical intelligence interpersonal intelligence,

intrapersonal intelligence, and naturalist intelligence scores of the girls who took part in the study were all higher, at a statistically significant level, than those of the boys.

Table 1. *Independent t Test Results for Intelligences and Gender of Students*

Intelligences	Gender	*n*	*M*	*SD*	*t*	*df*	Sig.
Verbal	Girls	284	4.0871	.52576	9.732	513	.000
	Boys	231	3.6123	.57978			
Kinesthetic	Girls	284	4.3029	.47659	3.393	513	.001
	Boys	231	4.1508	.54026			
Musical	Girls	284	4.2278	.47446	6.424	513	.000
	Boys	231	3.9302	.57681			
Interpersonal	Girls	284	4.2542	.44078	4.629	513	.000
	Boys	231	4.0601	.51018			
Intrapersonal	Girls	284	4.2116	.41536	7.113	513	.000
	Boys	231	3.9438	.43658			
Naturalist	Girls	284	4.0437	.60264	2.252	513	.025
	Boys	231	3.9246	.59043			

In Table 2, the mean scores for each of the intelligences is given. For visual-spatial intelligence, the highest mean was for the age of 16 and the lowest mean was for the 18-year-old group. For logical-mathematical intelligence the highest mean was for the age of 15 and the lowest mean was for the participants aged 17. The highest mean was for the 15-year-old participants and the lowest mean was for the 18-year-olds for intrapersonal intelligence. For naturalist and existential intelligences, the highest scores were for the 15 year-olds whereas the lowest mean for naturalist intelligence was for the participants aged 18 and the lowest mean for existential intelligence was for 17-year-old participants.

Table 2. *Mean Scores of Intelligences According to Age*

Intelligences	Age	*n*	*M*	*SD*	*SE*
Visual	15	39	4.0016	.50947	.08158
	16	177	4.0293	.50348	.03784
	17	201	3.9002	.58839	.04150
	18	95	3.7791	.63118	.06476
Logical	15	39	4.0978	.60404	.09672
	16	177	3.9105	.52686	.03960
	17	201	3.8210	.55911	.03944
	18	95	3.7688	.53347	.05473
Intrapersonal	15	39	4.2115	.45917	.07353
	16	177	4.1005	.45626	.03429
	17	201	4.1050	.43155	.03044
	18	95	3.9852	.43281	.04441

Table 2 continued

Intelligences	Age	*n*	*M*	*SD*	*SE*
Naturalist	15	39	4.2781	.47446	.07597
	16	177	4.0268	.58549	.04401
	17	201	3.9540	.57820	.04078
	18	95	3.8753	.68186	.06996
Existential	15	39	3.8870	.77036	.12336
	16	177	3.4915	.72474	.05448
	17	201	3.3334	.71115	.05016
	18	95	3.4659	.81018	.08312

When the results of ANOVA for intelligence scores and the age variable given in Table 3 are examined in detail, it is possible to say that there were statistically significant differences with respect to the age of the students for visual, logical, intrapersonal, naturalist, and existential intelligences. When the means of the scores of the participants are taken into consideration, the means for the scores for the students at the age of 15 for logical, intrapersonal, naturalist, and existential intelligences are higher than the other age groups and for visual intelligence 16-year-old participants' scores were higher.

Table 3. *ANOVA Results for Intelligence Scores and Age of Students*

Intelligences		*SS*	*df*	*MS*	*F*	Sig.
Visual	Between Groups	4.294	4	1.073	3.384	.010
	Within Groups	161.450	509	.317		
	Total	165.743	513			
Logical	Between Groups	4.935	4	1.234	4.116	.003
	Within Groups	152.586	509	.300		
	Total	157.521	513			
Intrapersonal	Between Groups	2.256	4	.564	2.884	.022
	Within Groups	99.537	509	.196		
	Total	101.793	513			
Naturalist	Between Groups	5.011	4	1.253	3.553	.007
	Within Groups	179.472	509	.353		
	Total	184.483	513			
Existential	Between Groups	13.296	4	3.324	6.088	.000
	Within Groups	277.919	509	.546		
	Total	291.215	513			

The results indicate that there were statistically significant differences amongst the age groups for visual, logical, intrapersonal, naturalist, and existential intelligences. The least significant difference (LSD) test was used in order to find out in which groups these differences were significant. The age groups among which statistically significant difference were found are presented below:

For visual-spatial intelligence, after the LSD analysis, it was found out that there was a significant difference between the responses of the students at the age of 15 and the 18-year-olds ($p = .038$); between 16-year-olds and 17-year-old students ($p = .07$); and between the students at the ages of 16 and 18 ($p = .001$). For logical-mathematical intelligence, there was a statistically significant difference between the 15-year-old students and the students at the age of 17 ($p = .004$), and between the 16-year-olds and 18-year-old students ($p = .042$). For intrapersonal intelligence, a statistically significant difference was found between the 15-year-old students and students at the age of 18 ($p = .007$), between the 16-year-olds and the students at the age of 18 ($p = .041$), and between the 17-year-olds and 18-year-old students ($p = .030$). For naturalist intelligence, similar results were found as there were statistically significant differences between the 15-year-old students and the students at the age of 16 ($p = .017$), between the 15-year-olds and the 17-year-old students ($p = .002$), between the students at the age of 15 and the 18-year-olds ($p = .000$), and between the students at the age of 16 and the 18-year-old students ($p = .045$). Finally, statistically significant differences were found for existential intelligence and these differences were between the 15-year-olds and 16-year-old students ($p = .003$), between the 15-year-olds and 17-year-old students ($p = .000$), between the 15-year-olds and the students at the age of 18 ($p = .003$), and between the 16-year-old students and the students at the age of 17 ($p = .038$).

Discussion

Nobel Prize winner, Roger Sperry, initiated the study of the relationship between the left and right hemispheres of the brain (Dew, 1996). He described how the left side functions in an analytical, rational, logical, and sequential way to break down information into pieces for analysis purposes whereas the right side of the brain functions by recognizing relationships, and integrating and synthesizing information by intuitive insights to see the whole picture. In addition, Walker (2005) observed that women are considered to use both sides of their brain and the characteristics of women seem to be features of the right hemisphere. On the other hand, Rohr and Martos (1996) emphasized that men use the left side of their brain more than the right side, whereas women use right hemisphere more.

The results of our study with respect to gender indicate that there were statistically significant differences for verbal-linguistic, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalist intelligences among our participants. When the results are examined in detail, the intelligences scores of the girls are much higher than those of the boys. In other words, the statistically significant differences are in favor of the female students. In the light of the gender

differences reported in the literature, it is possible to say that female students tend to use both sides of their brain, with the dominance of right side (Farrel & Farrel, 2007) and this pattern of use causes the significant differences we found for verbal-linguistic, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalist intelligences in favor of the girls in our study. It is also important to point out that the characteristics of the intelligence types listed here are features of the right hemisphere of the brain (Farrel & Farrel, 2007; Rohr & Martos, 1996; Walker, 2005). Differences in intelligence types between the two genders mean that males and females require different teaching techniques. Indeed, Mahlomaholo (2011) draws attention to how teaching boys and girls differs in other parts of the world.

When the intelligence scores of the participants were compared with respect to their ages, the highest mean for visual intelligence was for 16-year-old students and the lowest mean was for 18-year-old students. For logical-mathematical, intrapersonal and naturalist intelligences, students at the age of 15 had the highest mean and 18-year-old students had the lowest mean. For existential intelligence, the 15-year-olds had the highest mean whereas the students at the age of 17 had the lowest mean. Furthermore, the LSD test results support the findings that the significant differences were generally found between the younger students (at the ages of 15 and 16) and the older students (at the ages of 17 and 18).

Towards the end of high school education, as teenagers grow up they start to consider, and worry about, opposite-sex related issues (love) and the university entrance examinations, and these concerns lead to a higher level of anxiety. Therefore, it is possible to say that, these factors influence the concentration of high school students. The results in this study show that the younger participants, aged 15 and 16, were more active, more open-minded, and more interested in a variety of things, whereas the older participants, aged 17 and 18, seemed to be anxious about making decisions as to which university and which department to choose, where to work, how to be accepted by the society or how to be involved in groups, and how to maintain a relationship with a member of the opposite sex.

Following Gardner's (1983) seminal work, in which he defined seven intelligences as logical-mathematical intelligence, verbal-linguistic intelligence, musical-rhythmic intelligence, visual-spatial intelligence, bodily-kinesthetic intelligence, interpersonal intelligence, and intrapersonal intelligence, the topic of multiple intelligences has attracted immense attention from researchers In 1999, Gardner added naturalist intelligence and in 2009 he further added existentialist intelligence, adding up to nine multiple intelligences.

In a nutshell, there has been a dearth of research conducted in relation to producing national MI inventories. However, in relation to the applications of MI theory, there is a considerable body of research (Al-Sabbah, Mey, & Lan, 2010; Doğan & Alkış, 2007; Emig, 1997; Gardner & Hatch, 1989; Hajhashemi & Eng,

2010; Korkmaz, Yeşil & Aydın, 2009; Köroğlu & Yeşildere, 2004; Şarvan & Pulur, 2008; Tirri & Nokelainen, 2008; Tracey & Richey, 2007). MI theory draws researchers' attention to the diversity in learners' intelligence, and diversity of teaching skills has been taken into consideration as well (De Lange, 2012; Horn, 2009; Mitchell, 2008; Van Der Walt & Maree, 2007).

The popularity of Gardner's theory of multiple intelligences can be attributed to its suitability to wider contexts. Indeed, ours was a case study based on a multiple intelligences inventory (Meneviş, 2011) developed in order to evaluate the multiple intelligences of high school students in the specific context of North Cyprus. The study, therefore, can be repeated in different contexts in order to improve its generalizability.

As an extension of our study, qualitative research could be conducted to shed more light on the results of this study and to give more vivid detail on the reasons for these differences. In addition, the same study could be repeated in different locations and the results compared with those obtained in this study.

In conclusion, our findings in this research support the idea that there are individual differences among students and that these differences should be valued by teachers and, above all, the education system. Currently, the education system that operates in North Cyprus and Turkey values achievement tests that focus on verbal-linguistic and logical-mathematical intelligences and on receptive, rather than productive, skills. Our findings in this study support Gardner's idea that education systems block students' way to success rather than motivating them to proceed with what they would succeed in (Gardner, 1983). This idea is based on the fact that MI theory is related mainly to learning of learners. However, it should be highlighted that using a variety of strategies while teaching would have a significant and positive impact on school-based learning.

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