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Exploring the impact of sports participation on multiple intelligence development of high school female students

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After Gardner had introduced the Multiple Intelligence (MI) theory, many researchers tried to find out the possibilities of applying this theory in the education domain. Moreover, the effects of different kinds of athletic applications on intelligence development within the framework of this theory have also been under investigation. This study also tried to explore the possible effects and relations of athletic participation in school sports competitions on MI types of high school female students. For this purpose MI inventory was applied to 198 female students and the data derived from this inventory was evaluated through SPSS 19.0 package programme using descriptive statistics, independent samples t test and Pearson Product Moment Correlation test. The t test results of this research clearly pointed out that participation to athletic activities had significant effects on the verbal/linguistic and bodily/kinaesthetic intelligence development of the students which was also verified through correlation analysis. Besides, correlation analysis showed that there was a significant positive relationship between interpersonal intelligence and sport experience.

Key words: multiple intelligence theory, intelligence, female athlete students.

INTRODUCTION

Traditional education programs have always focused on verbal and mathematical intelligences, which are defined in terms of intelligent quotient (IQ). The three-quarter-century-old, statistical science behind traditional IQ testing was harshly criticised as it was narrow, biased, and even racist, supporting eugenics (Turkmen, 2013). Gardner, who shared the same criticisms on the traditional understanding of intelligence, proposed the existence of at least seven basic intelligences in *Frames of Mind* (1983); and afterwards added an eighth category of intelligence (Gardner, 1983; Gardner, 1999). According to Gardner's point of view humans possess a number of distinct intelligences that manifest themselves in different skills and abilities. All human beings apply these intelligences to solve problems, invent processes, and create things. Intelligence, according to MI theory, is being able to apply one or more of the intelligences in ways that are valued by a community or culture (Bas and

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Beyhan, 2010).

Gardner (1991) divided the intelligences into eight different types and defined them:

1. Verbal/linguistic intelligence: the production of language, abstract reasoning, symbolic thinking, conceptual patterning, reading, and writing.
2. Logical/mathematical intelligence: the capacity to recognize patterns, work with abstract symbols (e.g., numbers, geometric shapes), and discern relationships or see connections between separate and distinct pieces of information.
3. Visual/spatial intelligence: visual arts, navigation, mapmaking, architecture, and games requiring the ability to visualize objects from different perspectives and angles.
4. Bodily/kinaesthetic intelligence: the ability to use the body to express emotion, to play a game, and to create a new product.
5. Musical/rhythmic intelligence: capacities such as the recognition and use of rhythmic and tonal patterns and sensitivity to sounds from the environment, the human voice, and musical instruments.
6. Interpersonal intelligence: the ability to work cooperatively with others in a small group, as well as the ability to communicate verbally and nonverbally with other people.
7. Intrapersonal intelligence: the internal aspects of the self, such as knowledge of feelings, range of emotional responses, thinking processes, self-reflection, and a sense of intuition about spiritual realities.
8. Naturalistic intelligence: the ability to recognize patterns in nature and classify objects, the mastery of taxonomy, sensitivity to other features of the natural world, and an understanding of different species.

Gardner's theory attracted the intention of educators, and they started accepting all children as equals regardless of a quotient produced from an intelligence exam or of academic areas for which they develop competence. Practitioners of MI theory think that children do not fit a single prototype. Gardner sought to broaden the perception of human potential beyond the confines of traditional IQ scores, seriously questioning the validity of determining an individual's intelligence through the practice of taking the person out of his or her natural environment and asking him or her to attempt isolated tasks never done before—and probably never to be done again (Stanford, 2003).

MI theory has broken down the traditional education approaches which have ignored different capacities and talents of children, and served as a rallying point for a reconsideration of the educational practice of the last century. Therefore after the introduction of MI theory in educational programs, even unsuccessful, unmotivated students had chance to record academic growth when exposed to multifaceted interventions and techniques principled by MI theory (Janes et al., 2000).

Harmer (2001) pointed out that accepting the predomination of different intelligences in different people, we accept that the same learning task may not be appropriate for all our students. While people with a strong logical/mathematical intelligence might respond well to a complex grammar explanation, a different student might need to comfort of diagrams and physical demonstration because their strengths is in the visual/spatial area. Other students who have a strong interpersonal intelligence may require a more interactive climate if their learning is to be effective (Harmer, 2001).

On the other hand, during last few years there have been an important amount of critical analysis on MI theory and its application in education domain. Akpınar and Dogan (2011) listed the main criticisms:

1. MI theory confuses intelligence with abilities; therefore the categorization of MI is not valid and reliable.
2. MI theory is not practical to be applied to education in different cultures as it was primarily developed for talented students in US.
3. Scientists and psychologists have underlined that this theory doesn't have scientific and empirical basis. Therefore MI is more a theory than a scientific methodology.

Despite these kinds of criticisms towards MI theory, scholars still continue to study the probable effects of MI on different target groups, in alternative learning environments, with different teaching tools, etc.

Sport is also one of the main tools which has always been associated with education and intelligence development. Although many researches have been carried out in order to find the effects of sports participation and physical activity on academic success, to date, limited number of researches focused on the probable effects of sports participation on multiple intelligence development. Therefore, this research is important as it tries to point out the relationships between sports participation and multiple intelligence development of high school female students. Besides, this research will also inspire further studies exploring the various aspects of sports participation, academic success, psychological and sociological development of students with special reference to MI theory applications.

MATERIALS AND METHODS

Sample group

198 female high school students ($\overline{X}$ age = 16.09) voluntarily participated in this study; 113 of them were non-athletes, and 85

Table 1. Age distribution of the sample group.

	n	$\overline{X}$ (age)	SS (years)
Students	198	16.09	1.48

athletes representing their schools in inter school competitions during 2014-2015 education season in team sports (Basketball, Volleyball, and Petanque). All the students were attending to 6 different high schools located in Ankara, Turkey. The age distribution of the sample group is presented in Table 1.

Data gathering tool

In order to analyze the multiple intelligence levels of the students, Turkish version of Multiple Intelligence Inventory (MII) developed by Seber (2001) was used. This inventory is composed of 64 questions, 8 questions for 8 types of intelligence, and was prepared as a three-point likert type scale (which was used to differentiate orientations from 1 as low and 3 as high).

Reliability and data analysis

The data derived from MII was evaluated using SPSS 19.0 statistical package programme for windows through arithmetic means ($\overline{X}$), standard deviation (SD), independent samples t-test (p) and Pearson Product Moment Correlation test. For the statistical significance, p value was taken as 0.05 ($p<0.05$) for the t-test, and as 0.05 ($p<0.05$) for correlation test.

In order to find out the relationship between each separate multiple intelligence type and sports participation level (SPL) correlation analysis was conducted. Although Tabachnick and Fidell (2001) underlined that correlational studies cannot use to explain causality, this type of study at least can indicate whether a change in the value of the independent variables has a significant effect on changes to the dependent variables (Althouse, 2007).

A reliability analysis with calculation of Cronbach's alpha was also conducted to determine if the measurement tools were acceptable and reliable or not. Cronbach's alpha was calculated as 0.84 which indicates that the items of the test have relatively high internal consistency. The p value was taken as 0.05.

Calculation of sports participation level (SPL) scores

In order to calculate the SPL scores, a question (*How long have you participated to school sports competitions?*) was added in the demographic information part of the inventory. The answer has 5 alternative items; *"I have never participated", "It's my first year", It's my second year", It's my third year"*, and *"More than 3 years"*, and each item was given scores rising up from "1" to "5" respectively. This score is important in the study in order to find out and interpret the relation between the development of intelligence types and SPL. The calculated SPL scores are presented in Table 2.

Table 2. Sports participation level scores.

Sports participation level	Total	
	N	Score
Non-athlete	113	113
1st year	14	28
2nd year	28	84
3rd year	31	124
+3 years	12	60
TOTAL	198	409
Average score of SPL	2.065	

FINDINGS

The results which are gathered through the inventory form are presented in below tables. The t test results and correlation tests are given in 2 separate tables. In the correlation table, only the results which are significant were included, and the rest were ignored.

In Table 3, when the arithmetic averages are compared between two groups of students (athletes and non-athletes), slightly higher averages are observed in verbal/linguistic, logical/mathematical, bodily/kinaesthetic, interpersonal, intrapersonal and naturalist intelligence types for athlete students. On the other hand the average of musical and visual/spatial intelligence is slightly higher for non-athlete students.

Examining the differences between the students of these two groups through independent samples t test, there occurs meaningful difference only in 2 types of intelligences; verbal/linguistic intelligence ($p= ,008$, $p > .05$) and bodily/kinaesthetic intelligence ($p= ,029$, $p > .05$) both for the superiority of athlete students. So there is no meaningful difference between two groups in the rest of 6 types of intelligences.

To have a more concrete idea about the effects of sports participation on the multiple intelligence levels, Pearson Product Moment Correlation test was conducted between the intelligence types and the SPL scores, and the significant results are presented in Table 4.

According to the results of Pearson Product Moment Correlation test, there are significant positive relations between SPL scores and verbal/linguistic intelligence ($r= .643$), bodily/kinaesthetic intelligence ($r= .393$), and interpersonal intelligence ($r= .241$).

In Table 4 only significant results are presented. This is to mean that there are no correlations found either positive or negative according to SPL scores of the students in logical/mathematical, intrapersonal, naturalist intelligence, musical and visual/spatial intelligences. These results show that the increasing sport participation helps students' verbal/linguistic intelligence, bodily/ kinaesthetic intelligence, and interpersonal intelligence.

DISCUSSION AND CONCLUSION

Although there have been very harsh criticisms towards

Table 3. Descriptive statistics and independent samples t test results of MI types.

Intelligence Type		N	$\overline{x}$	SS	t	SD	p
Verbal/Linguistic	Athletes	85	34.25	5.26	-3.193	196	**.008**
	Non-athletes	113	31.23	5.61			
Logical/Mathematical	Athletes	85	33.21	5.81	-1.426	196	.153
	Non-athletes	113	32.87	4.81			
Visual/Spatial	Athletes	85	33.21	5.17	-1.182	196	.240
	Non-athletes	113	35.06	4.97			
Musical	Athletes	85	32.41	5.43	-1.559	196	.121
	Non-athletes	113	33.51	5.54			
Bodily/Kinaesthetic	Athletes	85	36.72	5.53	-2.132	196	**.029**
	Non-athletes	113	32.52	6.61			
Interpersonal	Athletes	85	34.26	5.41	-1.332	196	.140
	Non-athletes	113	32.72	4.63			
Intrapersonal	Athletes	85	34.81	5.51	-1.189	196	.235
	Non-athletes	113	33.58	6.20			
Naturalist	Athletes	85	34.71	5.91	-.415	196	.852
	Non-athletes	113	34.28	5.83			

Table 4. Correlations found between intelligence types and SPL.

Intelligence Type	r
Verbal/Linguistic	.643
Bodily/Kinaesthetic	.393
Interpersonal	.241

*p < 0.05

MI theory (Akpınar and Dogan, 2011), it is still very popular in education domains and have seriously been investigated in order to be implemented in the education curriculums. Numerous researches have been carried out through case studies in order to compare the effectiveness of traditional education methods with MI supported learning methods. Most of these studies clearly pointed out that MI approach is much more effective on the development of students' academic achievement levels when compared to traditional teaching methods (Coskungonullu, 1998; Erkan and Uster, 2012). It is also important to note that there are a few other researches in which no difference was observed in the academic achievement levels of the students attending to traditional education programs and MI based education programs (Demirel et al., 2000; Yurtluk, 2003).

Another important research subject has been the use of MI theory in physical education classes (Gorucu, 2007; Tekin and Tasgin, 2008), and positive effects of MI approach has been noted. Also some researchers, such as Mitchell and Kernodle, have focused on the use of MI theory for more effective training of specific sport branch, which is tennis in their study (Mitchell and Kernodle, 2004). Similarly Ilhan et al. (2005) tried to find out the effects MI theory on teaching volleyball and gymnastic units.

On the other hand some other scholars approached from the opposite direction, and explored the effects of sports participation on MI development. On exploring the literature to date, there are many case studies which have been carried out in order to point out the relationship between specific sport practices and MI development. Turkmen (2013) tested 9th grade students before and after 12 weeks of taekwondo training, and concluded that taekwondo training had positive significant effect on bodily/kinaesthetic and interpersonal/social intelligence levels which also led to overall development of cumulative intelligence level. Cengiz and Pulur (2008) have adopted 12 weeks football training to the 8-10 years old children, and found that bodily/kinaesthetic and musical intelligences developed. In this study it was pointed out that football training had positive effects on the development of both intelligences. Another case study was carried out by Bozkus, who preferred to investigate the effects of folk dance practices on the intelligence development of 5th grade students in terms of MI theory (Bozkus, 2010). After 16 weeks of folk dance practices, it was found that the experiment group had recorded meaningful development in all 8 intelligence types.

Some scholars approached the theory from different points of view and tried to define the MI types developed

in athletes, and the relations of MI types with various cognitive and psychological parameters (Ekici, 2011; Aktop and Karahan, 2012; Bavlı, 2013; Kutz et al., 2013; Bozkus et al., 2014; Kiremitci and Canpolat, 2014; Kul et al., 2014).

This study also tried to find out the effects of sports participation on the MI development of female students. As presented in Table 3, significantly higher scores were calculated in verbal/linguistic and bodily/kinaesthetic intelligence levels of athlete students when compared to non-athlete students. On the other hand there were no significant differences between the groups in the rest of 6 types of MI. Especially the finding about bodily/kinaesthetic intelligence is in line with the findings of the references cited, but for the rest of the intelligence types there were different results in previous studies. For example, in the case study carried out by Cengiz and Pulur (2008), it was musical intelligence with bodily/kinaesthetic intelligence which showed significant increase; and in Kul et al. (2014)'s study it was interpersonal intelligence. In another study further type of intelligence, which was spiritual intelligence was studied and significant difference was observed between athlete and non-athlete students (Solaimani et al., 2013). Therefore the only common MI type which is affected by sports participation appears to be the bodily/kinaesthetic intelligence, and the rest of intelligence types may differ according to the sample group, applied sports activities, demographic variables, etc.

In this study more important result was found in the correlation analysis which is presented in table 4. According to this table, not only verbal/linguistic and bodily/kinaesthetic intelligences but also interpersonal intelligence appeared to have significant relation with SPL. As there is no meaningful difference between athletes and non-athletes in interpersonal intelligence levels (table 3), the positive relation found in correlation analyses is very important. This difference in interpersonal intelligence appears to be clear evidence for the benefit of sports participation, and shows that increasing experience in school sports results with the increase of interpersonal intelligence level. As the general average of female participation to sports activities in Turkey is rather low when compared to male participation (Noordegraaf and Coknaz, 2014), these benefits appear to be important tools to promote girls' participation to sport activities both within school and club frame. Kiremitci (2014) also found out that participation to the sports activities helped to the socialization process of secondary school students as a result of increase in self confidence, self esteem, self expression, control of stress and anxiety, and some other positive psychological feelings.

To conclude, this study proved that female students' participation to school sports contribute to development of their specific intelligence types. Moreover, increasing sport participation experiences contribute to their socialization process through the development of interpersonal intelligence. Therefore girls should be encouraged to take part in school sport competitions, and more sport activities should be adopted as supplementary activities in the school curriculum. Further research is needed to understand the possible relationships between various variables, such as different sports, gender, psychological and cognitive skills, and MI development. And last, it is important in to underscore the main limitation of this study; this study did not apply an experimental or longitudinal design including changes over time. Thus, it would not be appropriate to interpret the results in terms of a casual effect between sports participation and multiple intelligence development.

Before concluding, it is important to note that further studies needed in order to find out the effects of sport participation on intelligence development according to different sport branches, such as team sports, martial arts, mind sports, precision sports, extreme sports, etc. It would be definitely interesting to put forward that sports have different effects on different types of intelligences which would be a valuable contribution for the selection of sport types.

Conflict of Interests

The author has not declared any conflict of interest.

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