

## Examining Gender Differences in Visual and Verbal Intelligence among Primary School Students

### İlköğretim Okulu Öğrencilerinde Görsel ve Sözel Zeka açısından Cinsiyet Farklılıklarının İncelenmesi

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#### Öz

Cinsiyet farkı zeka alanında bireysel farklılık gibi diğer çalışmalarda açıkça görülmektedir. Gardner'ın geliştirdiği çoklu zeka kuramına göre, insanlar arasındaki farklılığa neden olan en önemli faktör zekadır. Bu makalede dili etkili kullanma becerisi olan sözel-dilsel zeka ve görsel düşünme, çizme, şekil verme gibi faaliyetlerin yer aldığı görsel-uzamsal zeka üzerinde duruldu. Zeka türleri cinsiyet yönünden de farklılık gösterebilirler. Her zeka türü kadın ve erkeklerde benzer değildir. Farklılığa neden olan bir diğer etmen ise ebeveynler ve kalıttır. Özellikle pek çok çalışma ile ilgilenen belirli zeka türlerinde cinsiyet farklılıklarını incelemek için, sözel ve görsel zeka çeşitleri, cinsiyet farklılıkları, ebeveynler ve kalıtımın 11 yaşındaki öğrenciler (13 erkek,15 kız) üzerindeki etkileri ölçmek için dördüncü sınıf öğrencileri (S=28) üzerinde bir öğretmenle görüşme de dahil olan etkinlikler gerçekleştirdik. Bu araştırmanın sonucu olarak, şaşırtıcı bir şekilde erkekler sözel-dilsel zekada iyi iken kadınlar görsel-uzamsal zeka ile ilgili faaliyetlerde daha iyi performans gösterebilmektedir. Bu sonuç cinsiyet eşitliğine ve kızların görsel-uzamsal zeka düşüklüğü olmadığına bir ipucu verir niteliktedir. Öğretmenle görüşme halinin ışığında ebeveynlik ve okul müfredatının daha fazla sözel ve görsel etkinlikleri artırması yönünde önem kazanmaktadır. Zekada cinsiyet farklılığını araştırmak için test ve psikometrik yetenek dahil daha fazla ilgili çalışmanın eklenmesi önerilmektedir.

**Anahtar Kelimeler:** *Sözel-Dilsel Zeka, görsel-uzamsal zeka, cinsiyet farklılığı, çoklu zeka kuramı, ebeveynlik*

#### Abstract

Gender difference like an individual difference in the area of intelligence is apparent with other studies. According to the multiple intelligence theory developed by Gardner, the most important factor that causes the difference between people is intelligent. In this research, it focused on the verbal-linguistic intelligence, which is skillful in using language effectively; visual-spatial intelligence of activities such as visual thinking, drawing, shaping. Each type of intelligence is not similar to males and females. Another factor that causes diversity is parents and heredity. In order to examine gender differences in certain intelligence types which mainly addresses with many studies, researchers conducted activities on fourth grade school students (N=28) including interview with one teacher to measure the effects of verbal and visual intelligence types, gender differences, parents and heritage on 11 years old student (13 boys and 15 girls). As a result of this research, surprisingly males are good at verbal-linguistic intelligence; females are able to perform better on visual-spatial intelligence related activity. This result gives a clue in gender equality and avoidance of female visual-intelligence-related partial inferiority. In light of interview with teacher, parenting and school curriculum clearly gain importance to add more verbal and visual activities. It is highly suggested to add more related studies including tested and psychometric ability to investigate gender difference in intelligence.

**Keywords:** *Verbal-linguistic intelligence, visual-spatial intelligence, gender difference, multiple intelligence approach, parenting*

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## INTRODUCTION

An individual difference is much clearly apparent in such factors as especially intelligence, culture, gender, socio-economic status, ability and related factors. Especially gender differences are relatively paid attention in many areas such as well-being (Khan, Watson, Naqvi, Jahan, & Chen, 2015), personality (Penny, Francis, & Robbins, 2015), career maturity (Tekke & Ghani, 2013), religiousness and spirituality (Simpson, Cloud, Newman, & Fuqua, 2008). It is of interest to many studies to investigate this difference. As it is known, beyond individual differences, both men and women are primarily different in terms of biological development. With this, there are different thoughts, feelings and behavior as demonstrated with some studies (e.g., Bocklandt & Vilain, 2007; Ngun, Ghahramani, Sánchez, Bocklandt, & Vilain, 2011). Gender differences in intelligence also concern the area of psychology, especially during the school years (Woolfolk, 2016). Studies show that female students are good at some certain intelligence, on the other hands males are good at some other intelligence. For example, Halpern and colleagues (2007) emphasized that “females perform better on assessment of verbal abilities when assessments are heavily weighted with writing and the language-usage. In contrast, males excel on certain visuospatial-ability measures” (p.40). It might be several reasons to account for this difference. Jacobs and colleagues (2002) argued that males feel much confident with some of the abilities such as math and sport, and females are competent with skills of language and arts. In light of this longitudinal research, it gives insight to gender differences are apparent with some certain abilities. This comparable abilities, therefore, might be properly cued to lead to a sort of intelligence differences.

Lindberg and colleagues (2010) have done meta-analyses, called “new trends in gender and mathematics performance: A meta-analysis” indicating that boys are more successful in mathematics than girls. This might be, of course, not reason with biology, such difference in mathematics derives from learning (Woolfolk, 2016). However, recently completed meta-analyses by Syzmanowicz and Furnham (2011) support gender equality due to the fact that direction and magnitude of variance have relatively fluctuated. Lindberg and colleagues (2010) suggest that “female math inferiority” needs to be cautiously evaluated. In fact, educational psychologists (e.g., Maeda & Yoon, 2012; Woolfolk, 2016) believe that some of the skills such as spatial and prediction skills are not well included in school curricula and even not well implemented in class. In addition, parenting role over child education especially providing much time to children in playing construction toys and legos is essential to enhance the child’s certain abilities (Buss, 1995). For example, this might be differently practiced that purchasing only dolls-related toys for girl and only cars-related toys for boys might be influential on child certain skill development as to “related to cultural variations in opportunity structures for girls and women (Else-Quest, Hyde, & Linn, 2010, s.103) so that variety of toys for children might be beneficial to enhance different sort of abilities. Males, on average, are better in spatial skills requiring space and prediction and females tend to experience design and language-related works.

In the literature review, heredity and environment (nature vs nurture) are the first and the most important factors discussed along with the many research projects in terms of gender differences. For instance, Nisbet (1953) studied the impact of family environment on intelligence and found that less contact of parents had degraded the verbal ability of children. When the family relationship is considered, parenting types of Baumrind (1991) takes a crucial part because each type has different effects on changing children’s verbal and visual abilities. Moreover, Garlick (2002) observed that intelligence is considerably hereditary by favour of a study composed of neuroscience and cognitive science besides environmental factors. Bronfenbrenner (1992) has declared the impact of environmental factors on individual differences classifying environment of a child in “Ecosystem Theory” from closest people to

further people around the child. Most steps of the system emphasize the importance of gender difference, especially macrosystem inferring the significance of the cultural values on children in terms of their genders. Because of gender disparateness, differences in heredity and environment highly cause individual differences in intelligence.

It appears that gender difference with intelligence, especially verbal-linguistic and spatial intelligence is due to an ongoing debate with intelligence on the gender difference in literature. One of the reasons for this debate is the reaction time. Boys improved their reaction time in verbal tests and became more active while girls' reaction time remained stable (Pascualvaca et al., 1997). Being impulsive and reacting fast were attributed to lower cognitive ability for only boys (Maccoby, 1967; Maccoby & Jacklin, 1974). On the other hand, another study showed that reacting fast indicates lower cognitive abilities for both genders in the same way (Pascualvaca et al., 1997). Another reason for the debate about intelligence on gender differences is called maturity. Girls mature earlier than boys (Tanner, 1962). It has been stated that older adolescents make fewer mistakes since physical development associated with cognitive performances, so boys are more impulsive in solving the test and make more mistakes. In the same verbal test, it was reported that because of maturity, a girl's attention span was more than a boy, so the girl used her visual scanning ability more properly.

This study will present insight guidance on gender difference for above mentioned intelligence types and including an interview with a teacher at least will give an idea on the practice of gender difference in classroom-setting. As well known theory, "Multiple Intelligence Theory" will be concerned accordingly. Within theory itself, the study again will address the types of visual and spatial intelligence. In fact, Gardner has developed eight different kinds of intelligence that make people different and special. Among these, special attention will be paid to the above types. Concisely, spatial-visual intelligence means the ability to enjoy visual ideas; verbal-linguistic intelligence refers to speaking and writing skills well. In this study, it will focus on gender difference with intelligence, especially verbal-linguistic and spatial intelligence.

## **METHOD**

The study was conducted in one of primary school on fourth-grade school children. There were totally twenty-eight pupils with 13 boys and 15 girls. Their ages were between 10 to 11 years. It was made three activities to figure out individual difference well, more particularly gender difference. More specifically narrative/storytelling methods for data collection were exploited accordingly as proposed by Gardner, Feldman, and Krechevsky (1998a,b). This in in fact called action research/intervention to engage participants to activities in order to assess their performance (Buschkuehl & Jaeggi, 2010; Dearbon, 2002). It also consisted of valid and reliable mentally stimulating activities.

Three activities studies were implemented and the eleven-year-old participants were observed according to visual and verbal intelligence types. In this purpose, researchers did three activities on fourth grade students to solve their verbal-linguistic and spatial-visual intelligence. With the reading test, students' verbal-linguistic intelligence; with the listening test, students' spatial-visual intelligence and lastly students' spatial-visual intelligence were observed according to students' performance on problem-solving, analytical and practical thinking.

Furthermore, the structured interview was conducted over primary school teacher who is teaching fourth-grade school at the same school in order to examine the effect on intelligence and gender difference in classroom teaching. Thematic technique was used to analyze the data. In order to obtain parental consent for the students, It has collaborated with classroom teacher

acting as legal guardians. Students have given their consent toward participating in the research after conducting the proper counseling.

## RESULTS

The aim of the first activity was to learn, to what extent students were good at reading and understanding in terms of verbal-linguistic intelligence, for instance, Eng and Mustapha (2010) have applied the method of "brainstorming" to examine the verbal-linguistic intelligence that is asking for "topic-word association". In this study, the story, whose name is "Specked Lamb", and related three questions were prepared. The papers were given to the students. After they took these papers, read this story and answered the questions. The activity lasted ten minutes in total. After the activity finished, all the papers came under review. The whole students answered all questions correctly, but only one male student responded to the question wrongly. However, some of them forgot writing their names and genders on the top of the paper. Although the students were not obliged to do this, researchers considered this situation with lack of care. During the activity, male students gave their papers early. If this factor is evaluated on the part of gender, researchers can conclude that males behave more quickly than females. As a part of intelligence, nearly all students were successful at reading and understanding the story in the class. In general, this activity demonstrated gender equality in verbal-linguistic as supported by meta-analysis findings (Syzmanowicz & Furnham, 2011). Additionally, researchers may evaluate related to the first experiment that being impulsive may not mean lower cognitive performance unlike early studies of Maccoby and Jacklin, (1974), although girls completed their papers late, their answers were correct.

Furthermore, the purpose of the second activity was similar to examine, to what extent students in light of sex differences are capable of listening and articulating the story using word choice and sentence structure in order to figure out verbal-linguistic intelligence. It is a listening story which has been done for the same students. Subsequently, the students have been asked four questions to understand how many of them will be able to learn by listening and responding. A story named "Red Apple Tree" has been read for the students. All of them have had responses to the four questions. After they have explained their responses, it was realized that male students have longer sentences based on ideas and word choice and they gave their responses more actively and fast. On the other hand, female students have answered the questions without completing their sentences using longer time, even if their answers have been correct. This difference indicates that males are more productive in the verbal-linguistic deduction. This can be a contrasting result as to often expressed in existential literature (e.g., Halpern and colleagues, 2007). However, There are some similar study findings as highlighted by meta-analysis study (e.g., Syzmanowicz and Furnham, 2011).

Lastly, the third activity was aimed to investigate the awareness of students using their visual-spatial intelligence properly. It was related to science and how the soap including chemical substances clean our bodies. According to this experience, students have raised awareness by associating to the washing hands. Firstly, it was asked what these items were and what would do with them. Most of the children raised their hands, researchers listened to them carefully, afterwards, the items were recognized to the students well. At the subject of identifying substances, the females were more successful than male students. However, the boys answered correctly questions, for example, "What will we do with this chemical soap?" It was taken one true answer from the male student despite the fact that most of the students wanted to answer. It was performed by telling every level of activity. In the following related activity of black pepper with water, the students were so surprised to disintegrate the black pepper on the water. They said that they wanted to realize it at their home. It was understood what they thought of black peppers or germs for cleanliness in conclusion. In total, this activity took only twenty minutes to perform well. These questions, which researchers prepared, were given to the students. As a consequence of this activity, it was observed long and logical answers with

female students while the male students were giving uncompleted answers. Researchers observed from the last experiment that girls behave more attentively and use their visual scanning ability properly to respond to the questions due to their maturity like in the early experiment of Pascualvaca and colleagues (1997). In this way, this experiment appeared to the conflicting finding on the gender difference in visual-spatial intelligence based on literature. Female students are more successful in visual-spatial intelligence as it is again expressed differently in literature. However, there are recently some meta-analysis findings discussing contrasting results (see reviews by Else-Quest, Hyde, & Linn, 2010; Syzmanowicz & Furnham, 2011). Taking this cue to gender difference might be surprisingly addressed the issue of gender equality from wide-ranging perspectives as it is discussed in recent studies.

Furthermore, researchers conducted an interview with a class teacher whether knowing the level of intelligence level of student will make classroom teaching differently or what extent teaching is successful. Following questions were directed to students' teacher and her answers quoted accordingly.

1. *What do you think that what the causes of intelligence are among your students?*  
"Parenting types, the child's own observations, heredity"
2. *Do you have any problems because of gender differences while teaching?*  
"I'm considering gender differences as a richness and trying to utilize them to reach children's abilities"
3. *What kind of methods or activities do you implement to teach in a heterogeneous class?*  
"I advocate that children will be able to learn to play, so researchers start to lesson with a game and the rest is easy"
4. *Which types of teaching methods do you use to help students be more successful?*  
"For physical and sensory improvement: Drama and regular physical activities. For cognitive improvement: Reading with full of pictures, writing, puzzle and other activities improving attention span. For social improvement: Tours are adjusted and real-life experiences are practised"
5. *Which of a student affect his success badly in your opinion?*  
"A kind of handicap or some problems based on parents' behavior may affect children's success badly".

In light of the teacher's explanation, it has clearly shown that parenting types and the impact of other environmental factors are so crucial in the development of individual intelligence besides heredity. The teacher performs her profession considering these developments and developmental differences. Hence, the teacher uses different kinds of activities (e.g., drama and game) helping to urge students' verbal and visual intelligence in various ways. Consequently, the early studies (Baumrind, 1966; Bronfenbrenner, 1992; Garlick, 2002; Nisbet, 1953) sustained their accuracy in terms of the information about the effect of heredity and environment on individual differences in intelligence.

## **DISCUSSION**

The study on fourth-grade students were evaluated according to the theory of multiple intelligence, especially verbal-linguistic and visual-spatial intelligence. Researchers slightly obtained different results that both females and males demonstrated different performance due to their environment, intelligence. At the first activity, it was observed that male students were faster than female students in terms of verbal-linguistic. Meanwhile, all of the students

have the same ratio on reading and understanding intelligence. At the second activity, again examining verbal-linguistic intelligence, it presents interesting result that male students were good at setting up longer and logical sentences, however, female students were capable of giving answers accurately with uncompleted sentence structure. This might be small disparity as argued by Syzmanowicz and Furnham, 2011. In the final activity, researchers should note that girls were aware of activity- related endings and boys were likely to focus on the activity-related process. While the girls were concluding some results from the activity, boys couldn't answer questions because they were only focusing on the structure of the activity when researchers observe their attention to the process of the activity. These three activities basically indicate gender differences in intelligence, but moderately as opposed to the findings in the literature. However, the ongoing debate on gender equality topic as argued in recent psychologists support that females are capable of doing visual and spatial doings. At the same time, males can be good at verbal-linguistic activities.

In fact, up to date "the notion that males estimate their overall and multiple intelligences higher than females" is going to be a slight turn to both gender benefits positively. Even though there are no huge differences between genders according to conducted activities, males are good at verbal activities and female are capable of visual-spatial activities. This view of gender difference with this study was supported accordingly. Recent findings of meta-analysis in light of gender difference began to discuss opposing findings. In fact, this study conducted further research by doing the interview with the school teacher. Findings related to the interview, obviously it points out parenting role might be effective on child intelligence level including heredity. Especially during preschool, time spent with children becomes valuable in terms of enhancing child abilities. In addition to this, classroom activities and curriculum should be revised to better possibilities in child intelligent development. This is possible to lead further studies to look at cultural variations, parenting role and other potential factors such as school curriculum.

As a result of this study, even though the findings produced differently from related studies (e.g, Baker & Wigfield, 1999), the explanation and overview of the recent widespread studies such as meta-analysis led to the discovery of the gender equality and even avoidance of "female visual-spatial inferiority". As for the underlying points, further research with interview indicated that parenting including school curriculum such as spatial and prediction skills related activities should receive relatively greater attention in order to enhance student intelligence. In fact, this study contains a clear limitation, especially the omission of tested/psychometric ability data will give us more accurate direction and magnitude. Therefore, the result should be cautiously interpreted. However, the study applied both activities as suggested by Gardner including structured make this finding meaningful at least providing insight into gender difference and classroom education.

## LIMITATIONS

As with any studies, limitations can be read cautiously in presenting conclusions. Buschkuehl and Jaeggi (2010) discussed deeply the way of improving intelligence investigation. Perhaps most obviously, measuring intelligence should include the control and experimental group having similar activities in different portion; careful selection of multiple tests; and assessment of long term effects. At least some investigation, inclusion of multiple choice test will make sense to figure out students' problem solving while doing action research (Sternberg, Torff, & Grigorenko, 1998). However, implementing over a significant number of participants, engagement in similar activities considering challenging, expensive time consuming may add some values to the present study. Finally, all findings of this study over limitations cannot be simply concluded that males are good at verbal-linguistic intelligence; females are able to perform better on visual-spatial intelligence related activity. In order to be confident demonstration of conclusion, it is necessary to use of other research designs.

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