Year: 2020
Volume: 7
Issue Number: 3
Doi : 10.4103/jnbs.jnbs_25_20

Received 16.10.2020
Accepted 13.11.2020
JNBS, 2020, 7(3):125-132

Emel Sari Gokten {ORCID: 0000-0003-3734-7895}
Burcu Uckun {ORCID: 0000-0002-9285-1640}
Ersin Budak {ORCID: 0000-0002-6507-505X}
Ali Evren Tufan {ORCID: 0000-0001-5207-6240}

THE RELATIONSHIP BETWEEN THE VISUAL-SPATIAL PERCEPTIONS AND FACE RECOGNITION SKILLS IN PARENTS OF THE CHILDREN WITH AUTISM SPECTRUM DISORDER

Emel Sari Gokten[1]*, Burcu Uckun[2], Ersin Budak[2], Ali Evren Tufan[3]

Ethics committee approval: An approval was granted for the study by the local ethics committee in Bursa Yuksek Ihtisas Training and Research Hospital (Date: 17.1.2015, No: ETK/2015/1232) and all study procedures were conducted in accordance with the Declarations of Helsinki and local laws and regulations.

Abstract

The aim of this study is to examine the correlation between the autism symptoms of children with Autism Spectrum Disorder and the visual-spatial perceptions and face recognition skills of the parents of these children. In the study, the parents of 30 children (30 mothers, 30 fathers) diagnosed with Intellectual Developmental Disorder and the parents of 30 children (30 mothers, 30 fathers) without any psychiatric disorder, totally 180 people, were assessed in order to compare the data of the parents of 30 children (30 mothers, 30 fathers) diagnosed with Autism Spectrum Disorder. Autism Behavior Checklist (ABC) was used in order to assess the symptoms of the children diagnosed with Autism Spectrum Disorder. Benton's Judgment of Line Orientation Test (BJLO), Benton Facial Recognition Test (BFRT), and Symptom Checklist (SCL-90) were used in order to assess the parents in three groups. It was found that there was no correlation between the autism symptoms of the children diagnosed with Autism Spectrum Disorder and the visual-spatial perceptions and face recognition skills of their parents. The spatial perception skills of the fathers in the Autism Spectrum Disorder group were higher compared to the mothers in this group ($p<0.001$), it was found that the 14.4% ($p=0.022$) of the BFRT scores of the fathers in the Autism Spectrum Disorder and 11.8% ($p=0.035$) of the BFRT scores of the fathers in the Intellectual Developmental Disorder group were explained by the BJLO scores. It may be useful to focus on the gender, face recognition skill and the visual-spatial perception performance when researching the genetical aspects of the face processing disorder seen as consistent information in the Autism Spectrum Disorder phenotype.

Keywords: visual spatial perception, face recognition skill, autism, gender, neuropsychology

[1]Child and Adolescent Psychiatry; Uskudar University Medical Faculty, Istanbul, Turkey

[2] Bursa Yuksek Ihtisas Training and Research Hospital, Child and adolescent psychology department, Bursa, Turkey.

[3] Child and Adolescent Psychiatry; Bolu Abant Izzet Baysal University Medical Faculty, Istanbul,

*Corresponding Author: [1]Child and Adolescent Psychiatry; Uskudar University Medical Faculty, Istanbul, Turkey. E-mail: esgokten@gmail.com

1. Introduction

It has been found that the individuals with ASD observe the featureless parts of a face more frequently and they observe the featured parts of faces (namely eyes, nose, and mouth) significantly less compared to the healthy individuals (Pelphrey et al., 2002). It has been assessed that the children with ASD were less successful in most parts of the face configuration function (emotion, gaze direction, gender and lip reading) compared to the healthy individuals, however, it was also assessed that the children with ASD configured faces in the high spatial frequency field (local facial features) better compared to the healthy individuals (Deruelle et al., 2004).

Face recognition is an important dimension of face processing through which the identity-related information is obtained (Mukerji et al., 2013). It has been assessed that the deterioration in the face processing observed in ASD is accompanied by the deterioration in the face recognition skills and the face recognition anomalies in ASD is not only explained by the deterioration in face processing (Joseph & Tanaka, 2003). It has been reported that the face recognition difficulties observed in ASD are more specific to the disorder at early ages compared to the healthy individuals and the difference in face recognition skills starts to decrease in the increasing ages (Fedor et al., 2018). However, it has been stated that there is a significant inconsistency between eye tracking and the neurobiological studies and there are both qualitative and quantitative differences between the individuals with and without ASD in face recognition (Tang et al., 2015).

The visual-spatial perception includes the perception of the space, visualization, and orientation, visual-spatial scanning, response speed, impulsivity, focused or continuous attention (Kurt, 2002). It has been revealed that children with ASD are better in some visual-cognitive tasks compared to normal children (Amudha et al., 2015). A study in which children with Asperger's syndrome, high functioning autism, and healthy individuals were compared, revealed that the individuals with Asperger's syndrome exhibited a higher performance for the thin detailed figures in terms of perception and memory (Zachi & Ventura, 2014). It was stated that although individuals with ASD displayed high performance in the visual-spatial tasks emphasizing local data processing, they cannot display the same performance related to the hierarchic stimuli (Guy et al., 2016). Some researchers have suggested that the hypothesis suggesting that the performance of the people with ASD in terms of visual-spatial tasks is neither better nor worse is not true compared to the healthy individuals (Falkmer et al., 2016).

It has been stated that advanced visual skills and atypical face processing may be the phenotype of ASD and the impairment in the face processing skill observed in the individuals with ASD may be inherited from generation to generation (Samson et al., 2012; Fiorentini et al., 2012). Visual-spatial perception is a cognitive process associated with visual skills (Kurt, 2002) and face recognition skill is a significant part of face processing performance (Joseph & Tanaka, 2003). Despite this, the correlation between the visual-spatial perception, face recognition skill and ASD symptoms in the parents of the children with ASD, has not been examined enough. Therefore, in the present study, it was first aimed to examine the correlation between face recognition and visual-spatial perception skills of the parents and autism symptoms of the children. Besides, it has been stated in the literature that gender has a confounding effect on spatial perception (Vecchi & Girelli, 1998) and face recognition (Lui et al., 2009) performance and ASD is observed in men 3 times more compared to women (Xu et al., 2018). For this purpose, the second aim of the present study is to compare the face recognition and visual-spatial perception skills among the mothers and fathers of the children with ASD. The third aim of the study is to compare face recognition and visual-spatial perception skills of parents in three groups (parents of children with ASD via healthy control and intellectual disabled children). Lastly, it was investigated whether the facial recognition performance of the parents in three groups were explained by visual-spatial perception.

2. Materials and Methods

An approval was granted for the study by the local ethics committee in Bursa Yuksek Ihtisas Training and Research Hospital (Date: 17.1.2015, No: ETK/2015/1232) and all study procedures were conducted in accordance with the Declarations of Helsinki and local laws and regulations.

2.1. Participants

Group 1: The children aged between 4-10 years, who were followed up in Bursa Yuksek Ihtisas Training and Research Hospital child and adolescent psychiatry outpatient clinic between 2016 and 2017 due to diagnosis of ASD and their parents were included in the study. The children were diagnosed with ASD by a child and adolescent psychiatrist based on the DSM-V criteria. All the children in Group 1 were getting special education and attending schools for autistics. A total of 68 parents including 34 mothers and 34 fathers who were voluntary to participate in the study and 34 children with ASD were assessed in terms of eligibility for the study. The inclusion criteria for the children with ASD were determined as follows; being diagnosed with ASD, being over the age of 4, and living with their family. The exclusion criteria for children with ASD were determined as follows; having additional diseases such as Down Syndrome, Fragile X syndrome, and Rubinstein-Taybi; having hearing and visual impairment; being severely physically disabled; having a specific birth injury and/or having a neurological disease (i.e. epilepsy).

The inclusion criteria for the parents of the children with ASD were determined as being over the age of 18, being at least primary school graduate, the mother and the father' living with the autistic child, and being alive mother and father. The exclusion criteria for the parents of the children with ASD were determined as follows; having any of the neuro-developmental and neuro-cognitive disorders, schizophrenia spectrum and other psychotic disorders, bipolar and related disorders, and drug and alcohol dependence disorders. Due to the inclusion and exclusion criteria, one couple was excluded as they got divorced, one couple was excluded as the father was diagnosed with deficits in intellectual functioning, 2 people were excluded with their spouses as they were not primary school graduate. As a result of this, a total

of 60 parents (30 mothers, 30 fathers; Group 1), who were voluntary to participate in the study and met the inclusion and exclusion criteria and 30 children with ASD were included in the study.

When it came to compare the parents of children with ASD, two other groups were comprised.

Group 2: 30 children, who were diagnosed with Intellectual Developmental Disorder (IDD) and aged between 4-10 years, and their parents (30 fathers, 30 mothers; Group 2) were invited to the study. The children in Group 2 were getting special education and attending schools for intellectual disabled children. The inclusion and exclusion criteria for the children in Group 2 were determined as Group 1. The parents in Group 2 were included in the study as they were exposed to the stress (due to negative effect caused by the treatment, care, education and behavioral problems of the children) similar with the parents in Group 1.

Group 3: In addition, the parents of the children being aged between 4-10 years and having no psychiatric disease (30 fathers, 30 mothers; Group 3) were invited to the study as the control group. The inclusion and exclusion criteria for the parents in Group 2 and 3 were the same as the criteria for the parents in the Group 1. The children in Group 3 were attending general primary schools.

In three groups included in the study, a total of 180 parents including 90 males and 90 females aged between 25-51 years, were assessed.

2.2. Measures

Before starting the study, the file records were examined and the participants followed up with the diagnosis of ASD and IDD were determined. The parents of the children who met the inclusion and exclusion criteria based on the file records were informed about the study and the parents and the children were invited to the study. Firstly, a child and adolescent psychiatrist reassessed the children based on DSM-V (American Psychological Association, 2013) diagnosis criteria, the eligibility of the children in three groups for the study were reviewed. Then, the parents in per group were assessed by the same interviewer based on the psychiatric interview and DSM-V diagnosis criteria in terms of eligibility for the study.

In order to assess autism symptoms of the children with ASD, the child and adolescent psychiatrist applied the Autism Behavior Checklist (ABC) for the children in Group 1 (The other two group did not take ABC since they were not autistic).

The parents who met the inclusion criteria were assessed by the experts (two psychologists who have the competence to apply neuro-psychological tests) in an environment suitable to take neuro-psychological measurements. The assessment order of the parents was determined randomly. In the study, Benton's Judgment of Line Orientation Test was used to measure the visual spatial perception skill, Benton Facial Recognition Test was used to measure the face recognition skills, and Symptom Checklist was used to measure the psychopathological characteristics. The order of application of the neurological tests was determined randomly for each participant.

2.3. The assessment of the child with ASD

Autism Behavior Checklist (ABC)

The ABC test is a measurement instrument with 57 items used to screen the autism symptoms of individuals (Krug et al., 1980). The scale assesses the autism symptoms in five subcategories: sensory, relating (social skills), body and object use, language, social and self-help. The Cronbach's α value of the scale was found as 0.92 in the validity and reliability study conducted in Turkey (Yilmaz-Irmak et al., 2007). A high score in the scale indicates that the autism symptoms of an individual are high.

2.4. The assessment of the parents in three groups

Symptom Checklist-90 (SCL-90)

It is an assessment instrument developed to assess the psychological problems and including nine subscales (Derogatis, 1983). There are subscales of the checklist as Somatization, Obsessive-Compulsive, Interpersonal sensitivity, Depression, Anxiety, Anger-hostility, Phobic Anxiety, Paranoid ideation, Psychoticism, and Additional Scale (Dağ, 1991). In addition, there is The Global Severity Index (GSI) to evaluate general psychopathology. GSI used for assessing the mental health of people is calculated by using all the items of the checklist. A high score obtained in GSI and its subscales indicates an increase in the mental problems.

Benton's judgment of line orientation test (BJLO)

It measures the visual-spatial perception and the other characteristics related to spatial perception (Benton et al., 1978). In BJLO, it is aimed to estimate accurately the spatial location of two lines. It is a measurement instrument sensitive to the damage of the right parietal hemisphere. The standardization of BJLO was performed in Turkey and its norm valueswere calculated (Karakas et al., 2004). A high score indicates that spatial perception performance increased the detection. It is a measurement instrument without time limitation and its application lasts for averagely 20 minutes.

Benton Facial Recognition Test (BFRT)

It was developed to determine the people's capacity of distinguishing and identifying the images of the faces of the unknown people (Benton, 1994). Norms are available up to the age of 74 years. The reliability and validity study of the test was performed in Turkey and their norm values were calculated (Keskinkılıç, 2008).

2.5. Ethical Considerations

An approval was granted for the study by the local ethics committee in Bursa Yuksek Ihtisas Training and Research Hospital (Date: 17.1.2015, No: ETK/2015/1232) and all study procedures were conducted in accordance with the Declarations of Helsinki and local laws and regulations. Parental informed consent and verbal assent of children (in verbal children) were required for study participation.

2.6. Statistics

In order to assess the sociodemographic characteristics of the participants, descriptive statistical methods such as percentage, mean, and standard deviation were used. Pearson Correlation Analysis was used in order to measure the correlation between ABC subscale scores of the

JNBS 2020 Published by Üsküdar University / www.jnbs.org

children with ASD and the BJLO, BFRT, GSI mean scores of the parents. Independent Samples t-test was used in order to compare the age, years of education, BJLO, BFRT, SCL-90 mean scores between the mothers and fathers. One-way ANOVA Analysis was used to compare the age, year of education, BJLO, BFRT, and SCL-90 mean scores among three groups. In this analysis, Tukey Test was used in order to determine the differences between the groups. Linear Regression Analysis was used in order to assess the part of the BFRT scores of the mothers and fathers explained by BJLO. Normal distribution hypothesis was met for Pearson Correlation Analysis, Independent Samples t-test, one-way ANOVA Analysis and Linear Regression Analysis. The level of significance for all the statistical analysis was $p<0.05$ and IBM SPSS statistics 22.0 software was used in performing the analyses.

3. Results

The average age of the children in three groups assessed in the study was 6.67±1.88, 7.17±1.70, and 6.13±1.87, respectively, the average ages among the three groups became different (F=2.5, p=0.082). 4 of the children in Group1 were girls (13.3%), 26 of them were boys (86.7%); 14 of the children in Group 2 were girls (46.7%), 16 of them were boys (53.3%); 16 of the Group 3 were girls (43.3%) and 14 of them were boys (46.7%) (Table 1).

Table 1. The comparison of the sociodemographic characteristics of the participants.

Autism Parent		n	Mean/sd	t	p
Age	Female	30	32.43±4.68	-3,29	0.002
	Male	30	36.63±5.20		
Year of education	Female	30	8.93±3.05	-1.36	0.180
	Male	30	9.93±2.63		
IDD Parent					
Age	Female	30	34.77±5.71	-3.15	0.003
	Male	30	39.10±4.90		
Year of education	Female	30	7.20±3.01	-0.42	0.674
	Male	30	7.53±3.09		
Control Group Parent					
Age	Female	30	33.93±4.40	-2.09	0.041
	Male	30	36.27±4.26		
Year of education	Female	30	9.13±3.43	-0.28	0.784
	Male	30	9.37±3.11		
All the mothers				**F**	**p**
Age	Autism	30	32.43±4.68	1.70	0.188
	IDD	30	34.77±5.71		
	CG	30	33.93±4.40		
All the fathers					
Age	Autism	30	36.63±5.20	3.08c	0.051
	IDD	30	39.10±4.90		
	CG	30	36.27±4.26		
All mothers					
Year of education	Autism	30	8.93±3.05	3.37b	0.039
	IDD	30	7.20±3.01		
	CG	30	9.13±3.43		
All the fathers					
Year of education	Autism	30	9.93±2.63	5.40a	0.006
	IDD	30	7.53±3.09		
	CG	30	9.37±3.11		

a, b, and c are Tukey test results. a= IDD<ASD,CONTROL. b= IDD, ASD, CONTROL. c= IDD>ASD,CONTROL.

Based on the Pearson's correlation analysis, it was assessed that there was no correlation between the autism symptoms of the children in Group 1 and the BJLO and BFRT scores of their parents. It was found that GSI scores of the fathers of the children in Group 1 had a positive correlation with the ABC social-self-help subscale scores of the children (r=0.40, p<0.05). It was found that BJLO and BFRT scores of the fathers of the children with ASD were negatively correlated (r=-0.41, p<0.05) (Table 2).

Table 2. The correlation between ABC subscale scores of the 30 children with ASD (Group 1) and BJLO, BFRT, and GSI scores of their parents.

		1	2	3	4	5	6a	6b	6c	7a	7b
1	Sensory	-									
2	Relating	0.63**									
3	Body and object use	0.68**	0.47**								
4	Language skills	0.34	0.38*	0.49**							
5	Social and self-help	0.39*	0.43*	0.35	0.44*						
6-Female (n=30)	6a-BJLO	0.01	-0.05	0.04	0.04	0.28					
	6b-BFRT	-0.03	-0.08	-0.24	0.03	0.01	-0.05				
	6c-GSI	-0.08	-0.09	-0.09	0.03	0.02	0.35	-0.19			
7-Male (n=30)	7a-BJLO	-0.13	0.11	0.13	0.19	0.19	0.08	0.05	0.06		
	7b-BFRT	0.27	0.00	-0.07	-0.20	-0.01	-0.21	0.09	0.08	-0.41*	
	7c-GSI	0.18	0.17	0.20	0.35	0.40*	0.08	0.10	0.14	-0.07	-0.05

*<0,05, **<0,01

JNBS 2020 Published by Üsküdar University / www.jnbs.org

Table 3. 2-way ANOVA analysis results related to interaction between groups and gender.

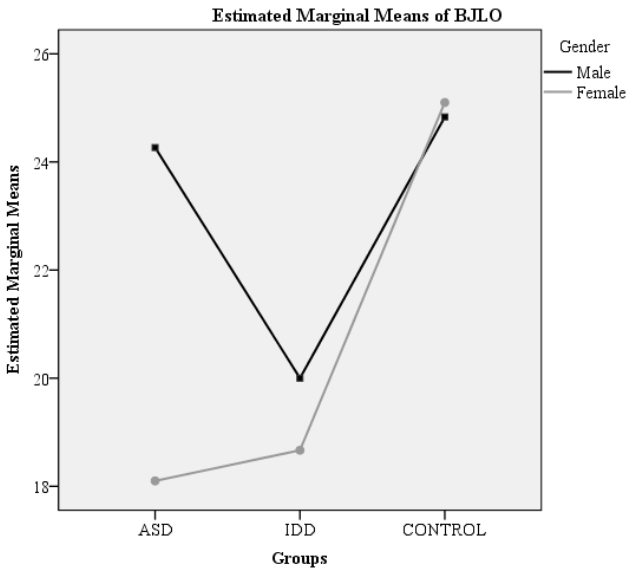
	Female	Male		Tukey HSD							
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	df	F	Group 1-2	Group 1-3	Group 2-3
Somatization	1.08±0.64	0.94±0.84	0.58±0.55	0.75±0.69	0.62±0.64	0.38±0.35	2, 174	0,08 a	NS	0,001	NS
Obsessive-Compulsive	1.21±0.73	0.92±0.70	0.70±0.59	1.04±0.56	0.92±0.84	0.55±0.50	2, 174	0,26 a	NS	<0,001	NS
Interpersonal Sensitivity	1.17±0.72	0.92±0.79	0.57±0.57	0.90±0.71	0.78±0.77	0.38±0.42	2, 174	0,47 a	NS	<0,001	0,008
Depression	1.26±0.74	1.20±1.00	0.58±0.66	0.74±0.67	0.70±0.69	0.44±0.41	2, 174	1,34 a	NS	0,001	0,003
Anxiety	0.87±0.69	0.72±0.65	0.42±0.49	0.59±0.51	0.53±0.68	0.27±0.29	2, 174	0,23 a	NS	0,001	NS
Anger-Hostility	0.86±0.72	0.84±0.81	0.55±0.66	0.81±0.65	0.67±0.74	0.47±0.61	2, 174	0,11 a	NS	NS	NS
Phobic Anxiety	0.60±0.60	0.36±0.47	0.20±0.25	0.35±0.45	0.24±0.44	0.10±0.17	2, 174	0,65 a	NS	<0,001	NS
Paranoid Ideation	0.82±0.73	0.93±0.84	0.73±0.62	0.88±0.57	0.72±0.62	0.61±0.60	2,174	0,60 a	NS	NS	NS
Psychoticism	0.75±1.08	0.44±0.44	0.17±0.28	0.51±0.49	0.39±0.63	0.17±0.25	2, 174	0,66 a	NS	<0,001	NS
Additional Scale	1.00±0.67	0.80±0.69	0.51±0.49	0.90±0.69	0.78±0.68	0.44±0.50	2, 174	0,06 a	NS	<0,001	NS
GSI	0.98±0.63	0.83±0.65	0.50±0.46	0.74±0.53	0.64±0.61	0.38±0.33	2, 174	0,17 a	NS	<0,001	NS

a>0,01, NS=Not Significant

The suitability of SCL-90 subscale scores for 2-way ANOVA analysis was checked with Levene Test. As a result, Levene Test was found to be significant (p <0.05). Therefore, it was decided that the significance level for this analysis would be p <0.01. According to 2-way ANOVA analysis performed between three groups according to gender, SCL-90 subscale score averages were not statistically different (p> 0.01) (Table 3).

The suitability of BJLO scores for 2-way ANOVA analysis was checked with Levene Test. As a result, Levene Test was found to be significant (p = 0.001). Therefore, it was decided that the significance level for this analysis would be p <0.01. According to the results of 2-way ANOVA analysis, the interaction between gender and groups was statistically significant [F (2, 174) = 5.84, p = 0.004]. However, the effect size (Partial Eta Squared = 0.063) was found to be small. In post-hoc comparisons using Tukey HSD, the BJLO scores from Group 1 and 2 were not statistically different (p = 0.145), in addition, the mean scores of BJLO of the parents in Group 3 were found to be statistically significantly different from the mean scores of the parents in Group 1 (p <0.001, 99% CI: LL = 0.89-UL = 6.68) and Group 2 (p <0.001, 99% CI: LL = 2.74-UL = 8.53) (Figure 1).

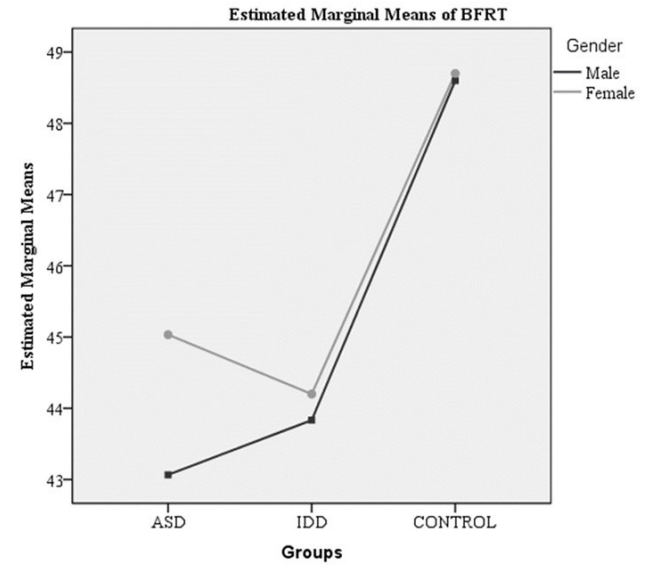
Figure 1: Estimated Marginal Means of BJLO



The suitability of BFRT scores for 2-way ANOVA analysis was checked with Levene Test. As a result, Levene Test was found to be significant (p = 0.014). Therefore, it was decided that the significance level for this analysis would

be p <0.01. According to the results of 2-way ANOVA analysis, the interaction between gender and groups was not statistically significant [F (2, 174) = 0.68, p = 0.507]. In post-hoc comparisons using Tukey HSD, the BFRT scores from Group 1 and 2 were not statistically different (p = 0.009), in addition, the mean scores of BJLO of Group 3 parents were found to be statistically significantly different from the mean scores of the parents was Group 1 (p <0.001, 99% CI: LL = 2.05-UL = 7.15) and Group 2 (p <0.001, 99% CI: LL = 2.08-7.19) (Figure 2).

Figure 2: Estimated Marginal Means of BFRT



Based on the linear regression analysis, it was found that 44% of BFRT scores of the mothers in Group 2 were explained by BJLO test (p<0.001). It was found that 14.4% (p=0.022) and 11.8% (p=0.035) of BFRT scores of the fathers in Group 1 and 3 of were explained by BJLO scores (Table 4).

Table 4. The efficiency of BJLO scores to account for BFRT scores.

Females	R2	Adjusted R2	B	SE	B	p
Group 1	0.003	-0.032	-0.064	0.215	-0.056	0.769
Group 2	0.460	0.440	0.587	0.120	0.678	<0.001
Group 3	0.112	0.080	0.296	0.157	0.335	0.071
Males	**R2**	**Adjusted R2**	**B**	**SE**	**B**	**p**
Group 1	0.173	0.144	-0.450	0.186	-0.416	0.022
Group 2	0.149	0.118	-0.242	0.109	-0.385	0.035
Group 3	0.001	-0.035	0.027	0.194	0.27	0.889

4. Discussion

As a result of the study, it was found that the visual-spatial skills of the mothers of the children with ASD was lower compared to the fathers of the children with ASD and the mothers of the healthy children. In addition, it was found that the face recognition skills of the parents of the children with ASD were similar and the face recognition skills of the parents of the children with ASD were lower compared to the parents of the healthy children. These results may indicate that the significant decrease of the face recognition skills of the parents of the children with ASD was similar in the parents and the decrease in the visual-spatial perception performance may differ based on gender. In the studies in the literature, it has been reported that the face recognition disorders in the mothers and fathers of the children with ASD are significant (Adolphs et al., 2008; Fiorentini et al., 2012) and the parents of the children with ASD has a relative weakness in the face memory skill and a relative strength in the visual recognition skill, similar to their children (Kuusikko-Gauffin et al., 2011).

It was found that the face recognition and visual-spatial perception skills of the mothers of the children with ASD and the mothers of the children with IDD were similar and the face recognition skill of fathers of the children with ASD was similar to the performance of the fathers of the children with IDD. The ASD and IDD diagnoses are evaluated in the category of neurodevelopmental disorders and it is stated that these two diseases have similarities and dissimilarities (Matson & Shoemaker, 2009). Additionally, it is reported that the apparent deficiencies in the face recognition field in the people diagnosed with ASD may be observed in the people diagnosed with IDD (Zaja & Rojahn, 2008). However, in the literature, there is no study examining the face recognition and visual-spatial perception skills of the parents of the children with IDD. In addition, it was assessed in the study that the spatial perception performance of the fathers of the children with IDD was lower compared to the fathers in the ASD and control groups. This may be associated with the fact that the ages of the fathers assessed in the IDD group were higher and their educational levels were lower compared to the other two groups in the present study. Because it has been revealed that the visual-spatial perception performances of the individuals may change according to educational period and age (Karakas et al., 2004).

It has been reported that the children with ASD aged between 4-18 years have more psychopathological characteristics compared to the children with IDD and the children with ASD have more emotional and behavioral problems (Brereton et al., 2006). The fact that the parents of the children with ASD have more mental problems compared to the parents of the healthy children in the present study may be associated with this situation. In a study comparing the parents of the children with ASD and IDD and the healthy children, it was assessed that the mothers of the children with ASD had higher depressive symptoms compared to the mothers of the children with IDD and the healthy children, which was compatible with the results obtained in the present study (Olsson & Hwang, 2001).

In the study by Wilson (2010), it was assessed that the face memory performance of the parents of the children with ASD, especially their fathers, was lower compared to the parents of healthy children. It was found that 14.4% of the face recognition skills of the fathers in the ASD group were explained by the visual-spatial perception skill. It has been stated that ASD is observed 3 times more among boys compared to girls (Xu et al., 2018).

Therefore, it has been discussed that some characteristics of male gender may cause ASD. According to the linear regression analysis, it was found that 44% and 11.8% of the face recognition skills of parents in IDD group were explained by the spatial perception skill. It has been stated that BJLO and BFRT may be used to assess the damages in the similar brain regions and both tests are sensitive to the functions of the right hemisphere and occipital cortex (Tranel et al., 2009). For this reason, the interaction between the face recognition and the spatial perception skills of the parents of the children with IDD and ASD may be associated with the anomalies in their parietal and occipital cortices. It was found that there was a negative correlation between the face recognition and spatial perception skills of the fathers in IDD group. When it is considered that the spatial perception and face recognition skills are the characteristics they affect each other positively, this result may be evaluated as unexpected data. However, some recent studies have revealed that the face recognition skills in the adults continue to develop as in the children and the space recognition skill slows down in the adulthood (Gomez et al., 2017; Grill-Spector et al., 2017).

The eligibility of the parents assessed in the study was assessed based on DSM-V. In addition, the IQ performance of the parents of the children with ASD and IDD was not investigated in the study. This may be evaluated as a significant limitation of the study. Another limitation of the study is that the diagnosis was not established for the cases using a structured interview chart and the diagnoses were established by a child and adolescent psychiatrist using the DSM-V diagnostic criteria. The other limitation of this study are that the number of participants assessed in the study was limited and the psychopathological characteristics were assessed with a psychometric measurement instrument.

Another limitation of the study is that the average age and gender of children in three groups could not be matched. Since the diagnoses of autism and mental retardation are different from each other and they are seen at different frequencies between genders, it was not possible to make matches. Also, the age and education levels of the parents in all three groups could not be matched exactly. In the study, the psychopathologies of the parents were evaluated using SCL-90, but there was no assessment of the parent-child interaction. This is another limitation of the research.

Patient informed consent: Informed consent was obtained.
Ethics committee approval: An approval was granted for the study by the local ethics committee in Bursa Yuksek Ihtisas Training and Research Hospital (Date: 17.1.2015, No: ETK/2015/1232) and all study procedures were conducted in accordance with the Declarations of Helsinki and local laws and regulations. Parental informed consent and verbal assent of children (in verbal children) were required for study participation.
Conflict of interest: There is no conflict of interest to declare.
Financial support and sponsorship: No funding was received.

Author contribution subject and rate:
Emel Sari Gokten (%40): Evaluation of psychiatric diagnoses, hypothesis develop, data analyze, wrote manuscript, revising it critically for important intellectual content.
Burcu Uckun (%20): Neuropsychological assessment, wrote manuscript.
Ersin Budak (%20): Hypothesis develop, neuropsychological assessment, data analyze, wrote manuscript.
Ali Evren Tufan (%20): Data analyze, wrote manuscript.

References

Adolphs, R., Spezio, M. L., Parlier, M., & Piven, J. (2008). Distinct face-processing strategies in parents of autistic children. Current Biology, 18(14), 1090-1093. doi:10.1016/j.cub.2008.06.073

American Psychological Association (2013). The diagnostic and statistical manual of mental disorders (DSM-5). Amudha, J., Nandakumar, H., Madhura, S., Reddy, M. P., & Kavitha, N. (2015).

Anandroid-based mobile eye gaze point estimation system for studying the visual perception in children with autism. In Computational Intelligence in Data Mining-Volume 2 (pp. 49-58). Springer, New Delhi.

Benton, A. L., Varney, N. R., & deS Hamsher, K. (1978). Visuospatial judgment: A clinical test. Archives of Neurology, 35(6), 364-367. doi:10.1001/archneur.1978.00500300038006

Benton, A. L. (1994). Contributions to neuropsychological assessment: A clinical manual. Oxford University Press, USA.

Brereton, A. V., Tonge, B. J., & Einfeld, S. L. (2006). Psychopathology in children and adolescents with autism compared to young people with intellectual disability. Journal of autism and developmental disorders, 36(7), 863-870. doi: 10.1007/s10803-006-0125-y

Cole, M. G., & Dendukuri, N. (2003). Risk factors for depression among elderly community subjects: a systematic review and meta-analysis. American Journal of Psychiatry, 160(6), 1147-1156. doi: 10.1176/appi.ajp.160.6.1147

Dağ, I. (1991). Belirti tarama listesinin (SCL-90-R) üniversite öğrencileri için güvenirliği ve geçerliği. Türk Psikiyatri Dergisi, 2, 5–12.

Derogatis, L.R. (1983). SCL 90 R: administration, scoring and procedures manual II for the revised version and other instruments of the psychopathology rating scale series (2nd ed.). Clinical Psychometric Research, Towson, MD.

Deruelle, C., Rondan, C., Gepner, B., & Tardif, C. (2004). Spatial frequency and face processing in children with autism and Asperger syndrome. Journal of autism and developmental disorders, 34(2), 199-210. doi: 10.1023/b:jadd.0000022610.09668.4c.

Falkmer, M., Black, M., Tang, J., Fitzgerald, P., Girdler, S., Leung, D., ... & Falkmer, T. (2016). Local visual perception bias in children with high-functioning autism

spectrum disorders; do we have the whole Picture?. Developmental neurorehabilitation, 19(2), 117-122. doi: 10.3109/17518423.2014.928387

Fedor, J., Lynn, A., Foran, W., DiCicco-Bloom, J., Luna, B., & O'Hearn, K. (2018). Patterns of fixation during face recognition: Differences in autism across age. Autism, 22(7), 866-880.

Fiorentini, C., Gray, L., Rhodes, G., Jeffery, L., & Pellicano, E. (2012). Reduced face identity after effects in relatives of children with autism. Neuropsychologia, 50(12), 2926-2932. doi: 10.1016/j.neuropsychologia.2012.08.019.

Gomez, J., Barnett, M. A., Natu, V., Mezer, A., Palomero-Gallagher, N., Weiner, K. S., ... & Grill-Spector, K. (2017). Microstructural proliferation in human cortex is coupled with the development of face processing. Science, 355(6320), 68-71. doi: 10.1126/science.aag0311

Grill-Spector, K., Weiner, K. S., Kay, K., & Gomez, J. (2017). The functional neuroanatomy of human face perception. Annual review of vision science, 3(1), 167-196. doi: 10.1146/annurev-vision-102016-061214.

Guy, J., Mottron, L., Berthiaume, C., & Bertone, A. (2016). A developmental perspective of global and local visual perception in autism spectrum disorder. Journal of autism and developmental disorders, 1-15. doi: 10.1007/s10803-016-2834-1.

Joseph, R. M., & Tanaka, J. (2003). Holistic and part-based face recognition in children with autism. Journal of Child Psychology and Psychiatry, 44(4), 529-542. doi: 10.1111/1469-7610.00142

Karakas, S., Eski, R., & Oktem-Tanor, O. (2004). Sayi dizisi ögrenme testi, cizgi yonunu belirleme testi, isaretleme testi, Raven standart progresif matrisler testi uygulama ve puanlama yonergesi [Line Orientation Test, Cancellation Test and Raven Standard Progressive Matrices]. In S. Karakas (Ed.), Bilnot bataryasi el kitabi: Noropsikolojik testler için arastirma ve gelistirme calismalari [BILNOT battery: research and development of neuropsychological tests] (pp. 257–302). Ankara, Turkey: Dizayn Ofset.

Keskinkılıç, C. (2008). Benton yüz tanıma testi'nin Türk toplumu normal yetişkin denekler üzerindeki standardizasyonu. Türk Nöroloji Dergisi, 14(3), 179-190.

Krug, D. A., Arick, J., & Almond, P. (1980). Behavior checklist for identifying severely handicapped individuals with high levels of autistic behavior. Journal of Child Psychology and Psychiatry, 21(3), 221-229.

Kurt, M. (2002). Görsel-Uzaysal Yeteneklerin Bileşenleri. Klinik Psikiyatri Dergisi, 5, 120-125.

Kuusikko-Gauffin, S., Eira, J. V., Alice, C., Rachel, P. W., Katja, J., Marja-Leena, M., ... & Irma, M. (2011). Face memory and object recognition in children with high-functioning autism or Asperger syndrome and in their parents. Research in Autism Spectrum Disorders, 5(1), 622-628. doi: 10.1016/j.rasd.2010.07.007.

Lui, Y. M., Bolme, D., Draper, B. A., Beveridge, J. R., Givens, G., & Phillips, P. J. (2009, September). A meta-analysis of face recognition covariates. In Biometrics: Theory, Applications, and Systems, 2009. BTAS'09. IEEE 3rd International Conference on(pp. 1-8). IEEE.

Matson, J. L., & Shoemaker, M. (2009). Intellectual disability and its relationship to autism spectrum disorders. Research in developmental disabilities, 30(6), 1107-1114. doi: 10.1016/j.ridd.2009.06.003

Mukerji, C., Perszyk, D., & McPartland, J. C. (2013). Face Recognition. In Encyclopedia of Autism Spectrum Disorders (pp. 1222-1226). Springer, New York, NY.

Olsson, M. B., & Hwang, C. P. (2001). Depression in mothers and fathers of children with intellectual disability. Journal of intellectual disability research, 45(6), 535-543.

Pelphrey, K. A., Sasson, N. J., Reznick, J. S., Paul, G., Goldman, B. D., & Piven, J. (2002). Visual scanning of faces in autism. Journal of autism and developmental disorders, 32(4), 249-261.

Samson, F., Mottron, L., Soulières, I., & Zeffiro, T. A. (2012). Enhanced visual functioning in autism: An ALE meta-analysis. Human brain mapping, 33(7), 1553-1581. doi: 10.1002/hbm.21307

Yilmaz-Irmak, T., Tekinsav-Sutcu, S., Aydin, A., & Sorias, O. (2007). An investigation of validity and reliability of autism behavior checklist, ABC. J Child Adolesc Ment Health (Turkish), 14(1), 13-23.

Tang, J., Falkmer, M., Horlin, C., Tan, T., Vaz, S., & Falkmer, T. (2015). Face recognition and visual search strategies in autism spectrum disorders: Amending and extending a recent review by Weigelt et al. PloS one, 10(8), e0134439.

Tranel, D., Vianna, E., Manzel, K., Damasio, H., & Grabowski, T. (2009). Neuroanatomical correlates of the Benton facial recognition test and judgment of line orientation test. Journal of clinical and experimental neuropsychology, 31(2), 219-233. doi: 10.1080/13803390802317542.

Vecchi, T., & Girelli, L. (1998). Gender differences in visuo-spatial processing: The importance of distinguishing between passive storage and active manipulation. Acta psychologica, 99(1), 1-16. doi: 10.1016/s0001-6918(97)00052-8

Wilson, C. E., Freeman, P., Brock, J., Burton, A. M., & Palermo, R. (2010). Facial identity recognition in the broader autism phenotype. PLoS One, 5(9), e12876. https://doi.org/10.1371/journal.pone.0012876

Xu, G., Strathearn, L., Liu, B., & Bao, W. (2018). Prevalence of Autism Spectrum Disorder Among US Children and Adolescents, 2014–2016. Jama, 319(1), 81–82.

Zachi, E. C., & Ventura, D. F. (2014). Visual Perception and Visual Memory Differences between Asperger Syndrome and High Functioning Autism. Investigative Ophthalmology & Visual Science, 55(13), 790-790.

Zaja, R. H., & Rojahn, J. (2008). Facial emotion recognition in intellectual disabilities. Current Opinion in Psychiatry, 21(5), 441-444. doi.10.1097/YCO.0b013e328305e5fd