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Early Risk Factors of Anxiety in Youth with Autism Spectrum Disorder

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Abstract

Objective: Anxiety is one of the most prevalent comorbid disorders in children with autism spectrum disorder (ASD). However, there is inconsistency in research investigating the predictors of anxiety in children with ASD. Thus, this study aimed to explore age, gender, ASD symptom severity, and functional language use as potential risk factors for developing anxiety in this sample.

Method: This study involved 150 children with ASD and their caregivers. The Gilliam Autism Rating Scale–Third Edition (GARS-3) and the Preschool Anxiety Scale (PAS) were used to gather data. The data were analysed using Independent sample t-tests, MANOVA, Pearson's r correlations, the point biserial correlation coefficient, and multiple regression analysis with the stepwise procedure.

Results: The findings indicated that anxiety was positively correlated with age and functional language use and negatively with ASD symptom severity. There wasn't a significant relationship between anxiety and gender.

Discussions: The findings suggest age and ASD symptom severity were significant predictors of anxiety in this sample. In other words, older children and cases with lower symptom severity are more likely to experience anxiety. It is also implied to examine the role of cognitive deficits in the development of anxiety in autism.

Keywords*:* Autism, neurodevelopmental disorder, Anxiety

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1. Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterised by persistent deficits in social communication and social interaction, as restrictive and repetitive patterns of behavior, interests, or activities that cause clinically significant impairment in several areas of functioning (American Psychiatric Association, 2013). Recent research indicate that comorbid disorders are common among children with autism spectrum disorder (ASD) (Guerrera et al., 2022). Anxiety has the strongest comorbidity with ASD in children and adolescents, with 30–80% meeting the threshold for a clinical diagnosis (Lau et al, 2020., Van Steensel & Heeman, 2017). There are some debates that cultural differences of the participants in different studies could be an explanation for the variation in reported prevalence rates of anxiety in children with ASD (Wijnhoven et al., 2018). On the basis of some research, cultural beliefs and values can protect children against or place them at risk for anxiety (Varela & Hensley-Maloney, 2009).

In order to prevent further exacerbation of comorbid anxiety in ASD, it is important to identify risk factors that predict the development of anxiety in this group. Additionally, prevention and treatment programs can also be tailored to at-risk children. Several studies identified some potential but inconsistent risk factors for developing anxiety in ASD (Behzadpoor et al., 2020).

Gender is one of the inconsistent but potential risk factors of anxiety in ASD. Among the studies investigated the relationship between gender and anxiety in ASD, some studies show that anxiety is more prevalent in girls than boys (May et al., 2014; Wijnhoven et al., 2018) and other studies indicated that boys with ASD have more anxiety symptoms (Thiele-Swift & Dorstyn, 2024; Dubin et al., 2015). Also, there is evidence that anxiety symptoms are equally prevalent in boys and girls with ASD (Magiati et al., 2016; Sukhodolsky et al., 2008; Vasa et al., 2013).

There are also mixed data regarding the prevalence rates of anxiety in ASD children with different ages. Most studies reported that anxiety in children with ASD increases with age (e.g., (Dubin et al., 2015; Mayes et al., 2011; Vasa et al., 2013; Williams et al., 2015). In contrast, Wijnhoven et al. (2018) reported that anxiety was less prevalent among older than among younger children with ASD. However, some evidence showed that there is no association between age and anxiety in children with ASD (Strang et al., 2012; Sukhodolsky et al., 2008).

ASD severity has also been implicated as another factor in the prediction of anxiety in children with ASD, albeit inconsistently. It has been suggested that children with less ASD symptomatology may be more vulnerable to anxiety disorders (Dellapiazza et al., 2022; Eussen et al., 2013; Mazurek & Kanne, 2010; Snow & Lecavalier, 2011; Vasa et al., 2013). In contrast, some research indicated that higher levels of anxiety were associated with greater ASD symptom severity (Mayes et al., 2011; Rosenberg et al., 2011; Sukhodolsky et al., 2008). However, some research failed to find a relationship between ASD severity and anxiety (Renno & Wood, 2013; Simonoff et al., 2008).

It is clear that there is inconsistency in findings of research exploring the prevalence and risk factors of anxiety in children with ASD. It is important to note, while many studies have investigated anxiety in children with ASD, research specifically on anxiety in preschoolers with ASD has been somewhat overlooked (Keen et al., 2019). Research shows that there may be a relationship between the type of anxiety symptomatology and age in children with ASD (van Steensel et al., 2011). Understanding anxiety disorders in early childhood can inform intervention and prevention efforts to prevent later anxiety in children with ASD. Finally, Cultural differences

have been frequently reported in internalized disorders including anxiety (Anderson & Mayes, 2010), but most research on anxiety in ASD has been conducted in the United States, Europe, and Australia and there are extremely few studies that investigated anxiety in Asian children with ASD (Magiati & Ozsivadjian, 2017; Ooi et al., 2014). Specifically, to date, no published study has examined anxiety in Iranian children with ASD. So, the first aim of this study was to investigate the prevalence of anxiety symptoms in a group of 3- to 6-year-old Iranian children with ASD. The second aim was to examine the risk factors for anxiety in this age group of Iranian children with ASD, Specifically, gender, age, functional language use, and ASD symptom severity were investigated as potential risk factors to develop anxiety in this sample of children with ASD.

2. Method

Participants

Participants consisted of 150 children with ASD (age; 37-71 months) who were referred for clinical services to two autism clinics in Tehran, Iran- Center for Treatment of Autistic Disorders (Tehran Autism) and Behara Education and Rehabilitation Center for Autistic Disorders. Inclusion criterion was sufficient knowledge of the persian language. Exclusion criteria were presence of othersevere psychological or neurological disorders and absence of parental permission. Caregivers of 150 children participated in this study (109 mothers, 35 fathers, 4 grandparents, and 2 babysitters)

Study Procedure

A total of 150 caregivers of children with ASD who interested in participating in the study completed a questionnaire on anxiety (Preschool Anxiety Scale (PAS)) and ASD severity (Gilliam Autism Rating Scale–Third Edition). First, parents received some information about the study by phone. If parents were interested in participation, they filled the questionnaires mentioned. Both questionnaires completed through an interview with caregivers by a trained psychologist. Caregivers also completed a Demographic Information form designed by authors.

Measures

The Gilliam Autism Rating Scale–Third Edition (GARS-3)

It is a tool for the assessment and diagnosis of autism based on DSM-V for individuals between the ages of 3 and 22 (Montgomery et al., 2008). GARS-3 gathers information in three areas (Stereotyped Behaviors, Communication, and Social Interaction) and it also contains a developmental history. It can give us a standardized score of autism severity. This is a standardized scale, which includes 42 items divided into three subscales based on the definition of autism on the diagnostic criteria for autistic disorder presented in DSM-V. It is validated and standardized on Iranian population by Samadi et al. (Samadi & McConkey, 2014).

The Preschool Anxiety Scale (PAS)

It is developed by Spence (Spence et al., 2001) to evaluate a wide range of anxiety symptoms in preschoolers aged 31 to 83 months based on Diagnosis and Statistical Manual of Mental Disorders-4th ed (DSM–IV) and consists of 28 items into five subscales: generalized anxiety disorder, social anxiety disorder or social phobia, separation anxiety disorder, obsessive-

compulsive disorder, and physical injury fears. The PAS also provides a total score of anxiety. Ghanbari et al (2011) in their research on Iranian children showed that subscales of PAS had moderate to high internal consistency and good reliability. Validity evaluations also yielded positive results (Ghanbari et al., 2011). The PAS has previously been employed and indicated to be a valid measure of anxiety levels in preschoolers with ASD (MacLennan et al., 2020; Potter et al., 2019). The score of obsessive-compulsive subscales was not included, because children with ASD serve this behavior for self-soothing or regulation of emotions (Scahill & Challa, 2016) and it is not related to anxiety. Furthermore, in the DSM5, the obsessive-compulsive disorder is considered as an anxiety disorder no more (Van Ameringen et al., 2014). Moreover, like Wijnhoven et al., we also defined the physical injury fears as "specific phobia" in this study, because the items of the PAS in this subscale do not only include physical injury fears but also include other specific fears such as fear of darkness and fear of heights (Wijnhoven et al., 2018).

Analysis

Independent sample T-test and MANOVA were used to examine gender differences. Pearson's correlations between PAZ total anxiety, age, and ASD severity were calculated. The point-biserial correlation coefficient is used to examine the relation between the level of total anxiety and gender. Because of inconsistencies in literature about predictors of anxiety in ASD, Multiple regression analysis with the stepwise procedure was used to reveal contributions of the dichotomous variables, gender (Male=0; Female=1) and functional language use (Yes=1; No=0), and scores on two continuous variables including age and autism symptom severity. Data were statistically analyzed by SPSS software (Version 21).

3. Results

Socio-demographic characteristics

The demographic information of children and their caregivers who participated in this study are shown in table 1. As shown in Table 1, 113 children were boys, and 37 of them were girls. All children were diagnosed with autism. Among children, 43.2% were between 3-4 years, 43.2% were between 4-5 years, and 13.6% were 5-6 years old. The majority of caregivers were college-educated (Table 1).

Table 1. Demographic data for the children and their caregivers

Child mean age (in months)	50.66 (SD = 9.73)
Child age range (in months)	37-71
Caregivers mean age (In years)	40.42 (SD = 6.1)
Mean total GARS scores	90.42 (SD = 11.6)
GARS total score range	70-119
	N (%)
Boys	113 (75.3)
Girls	37 (24.7)
Caregiver education	
Diploma	35 (23.3)
Associate degree	11 (7.3)

Bachelor	65 (43.3)
Masters	33 (22)
PhD	6 (4)

Gender differences in total anxiety and anxiety symptoms

We performed an independent t-test and MANOVA to examine the gender differences in total anxiety and anxiety symptoms among children with ASD. Table 2 shows the mean and standard deviation of total anxiety in boys and girls and results of t-test. The results indicated that there is no significant difference in total anxiety between girls and boys.

Table 2. Gender differences in total anxiety

	Male (n = 113) Mean (S.D)	**Female (n = 37) Mean (S.D)**	**t**	**p**
Total anxiety	27.69 (14.03)	24.43 (14.91)	0.955	0.342

Also, the results of MANOVA in table 3 showed that there are no significant differences between girls and boys in anxiety symptoms.

Table 3. Gender differences in anxiety symptoms

	Male (n = 113) Mean (S.D)	**Female (n = 37) Mean (S.D)**	**F**	**p**
generalized anxiety	5.85 (3.77)	4.96 (3.67)	0.98	0.324
social anxiety	7.99 (4.71)	6.13 (5.25)	2.55	0.114
separation anxiety	5.42 (3.41)	4.83 (2.9)	0.55	0.457
specific phobia	8.44 (4.43)	8.52 (5.11)	0.005	0.944

Relationship between risk factors and anxiety

The correlations between the four risk factors examined in this study (age, gender, functional language use, and autism symptom severity) and total anxiety were examined (Table 4).

Table 4. Correlation between scores of total anxiety and gender, functional language use, autism symptom severity, and age

	Gender	**functional language use**	**Autism symptom severity**	age
Total anxiety	-.099	.318**	-.354**	0.330**

**. Correlation is significant at the 0.01 level

As shown in table 4, There were no significant relationships between gender and overall anxiety ($r = -0.099$, $p > 0.05$). Total anxiety score was positively correlated with age ($r = 0.33$, $p < 0.01$) and functional language use ($r = 0.319$, $p < 0.01$). Finally, there was a significant negative correlation between total anxiety and autism symptom severity ($r = -0.354$, $p < 0.01$).

Prediction of anxiety based on risk factors

Stepwise regression analysis was used to examine the role of independent variables in the prediction of total anxiety. The results presented in Tables 5 and 6 (Table 5 and 6 near here).

The correlation coefficients showed that there was no significant relationship between gender and anxiety (see table 4), so gender didn't include as a predictor variable into the regression model. By including three variables, age, autism symptom severity, and functional language use into the stepwise linear regression analysis, only the autism symptom severity and age were significant predictors of anxiety ($P<0.01$). Functional language use was excluded variable and did not have a significant role in predicting total anxiety ($P>.05$). The model explained 22.7 of the total variance in predicting self-harm ($F = 12.153$, $p < 0.01$). symptom severity was the strongest predictor and entered the model first, followed by age. The first predictor accounted for 12.5% of the variance in anxiety ($F = 13.324$, $P < 0.01$). Age emerged as the second most potent predictor of anxiety and accounted for 10.2% of the variance in anxiety (see table 5). Table 6 shows that total anxiety decreases with symptom severity but increases with age.

Table 5. Summary of the Regression Model for the Prediction of Anxiety

Model	R	R^2	Adjusted R^2	Std. error	R2 changes	F changes	df1	df2	p
1	0.354[a]	0.125	0.116	13.388	0.125	13.324	1	93	0.001
2	0.447[b]	0.227	0.211	12.651	0.102	12.153	1	92	0.001

a. Predictors: (Constant), total Gilliam

b. Predictors: (Constant), total Gilliam, age

Table 6. Coefficients[a] of Regression for the Prediction of Anxiety

Model		Unstandardized Coefficients		Standardized Coefficients	t	p
		B	Std. Error	Beta		
1	(Constant)	66.026	10.805		6.111	0.001
	total Gilliam	-0.433	0.119	-0.354	-3.650	0.001

2	(Constant)	41.235	12.442		3.314	0.001
	total Gilliam	-0.420	0.112	-0.344	-3.751	0.001
	age	0.467	0.134	0.320	3.486	0.001

a. Dependent Variable: total anxiety

4. Discussion

The first purpose of this study was to present an overview of the prevalence of anxiety symptoms in an Iranian clinical sample of children with ASD. The findings showed that 57.9% of the children had at least one clinical anxiety symptom according to caregivers. The caregiver-rated prevalence of anxiety (57.9%) found in this study was approximately like the prevalence rates in some research such as the study of Strang et al. and Vasa et al. But in the research of Wijnhoven et al. (2018) more than 60% of the ASD children according to children and more than 80% of the children according to parents had at least subclinical anxiety symptoms. However, other studies reported that only 33 (Thiele-Swift & Dorstyn, 2024) and 11.1%% (Mutluer, et al., 2022) of the children with ASD had anxiety symptoms. Differences in the cultural background of the participants and in tools used to assess anxiety symptoms may partly explain the varying rate of anxiety symptoms reported in studies. Finally, anxiety levels may differ because of the differences in the age group of the sample.

The second aim was to investigate the risk factors for anxiety in this sample of children with ASD. More specifically, age, gender, ASD symptom severity, and functional language use were investigated as risk factors for anxiety in children with ASD. Regarding the differential prevalence rates of anxiety in boys and girls with ASD, no gender differences have been identified and the results showed that there weren't any relations between gender and anxiety. This finding was in line with research showing that there are no gender differences in anxiety between girls and boys with ASD (Magiati et al., 2016; Sukhodolsky et al., 2008; Vasa et al., 2013). However, this finding contradicts previous research that has shown girls with ASD are more anxious than boys ((Thiele-Swift & Dorstyn, 2024; May et al., 2014; Wijnhoven et al., 2018) or boys experience more anxiety than girls (Dubin et al., 2015). This result might be due to the unequal ratio of boys and girls in the sample group or differences of age and symptom severity between girls and boys who participated in this study that can influence on anxiety level.

Additionally, our results indicated that total anxiety symptom was more prevalent among older than among younger children with ASD and age was a predictor of anxiety. This finding is in line with previous studies that have shown that anxiety increases with age in the ASD population (Dubin et al., 2015; Mayes et al., 2011; Vasa et al., 2013; Williams et al., 2015) and is inconsistent with research citing a decrease in anxiety with age in youth with ASD (e.g., 35). Furthermore, the finding that ASD children with a low ASD symptom severity had higher anxiety levels is consistent with research showing that more severe ASD symptoms are related to fewer anxiety levels (Eussen et al., 2013; Dellapiazza et al., 2022; Mazurek & Kanne, 2010; Snow & Lecavalier, 2011; Vasa et al., 2013), but is inconsistent with the finding showing that children with greater ASD symptoms are more vulnerable to clinical anxiety symptoms (Mayes et al., 2011; Rosenberg et al., 2011; Sukhodolsky et al., 2008). This finding also extends the previous results

by showing that ASD symptom severity in a multivariate model is the strongest predictor of anxiety in ASD as compared to other factors such as age and functional language use. We can explain these results according to cognitive development. Young children are growing cognitively and their cognitive abilities increase with age. Theories of emotional development discuss that cognitive development plays an important role in emotions including anxiety (Case et al., 1988; Fischer et al., 1989). Some researchers found a positive relationship between cognitive development and the level of anxiety (Broeren & Muris, 2009; Muris et al., 2002; Vancu, 2018). Research on ASD children also found a positive relationship between cognitive ability and the level of anxiety (Mayes et al., 2011; Rieske et al., 2013). Younger children and children with more severe ASD symptoms may have more problems in expressing their emotions including anxiety because of their less communication and cognitive skills. Mayes states that anxiety symptoms likely require self-perception, levels of cognition, and social awareness. These requirements are not present in very young children with autism and severe cases of ASD, so they may be less aware of their impairments and their effects (Mayes et al., 2011). In this line, Mazurek and Kanne believe that weak emotional understanding and perspective-taking skills may prevent the development of anxiety symptoms in children with more severe ASD symptoms (Mazurek & Kanne, 2010). According to these explanations, experiencing anxiety requires some cognitive abilities impaired in children with severe ASD symptoms. So it is likely that children with more severe symptoms that have more cognitive impairments can't experience anxiety and some anxiety symptoms reported in these children may be characteristics of ASD or symptoms of fear.

In addition, the present study revealed that higher functional language use was associated with some higher levels of anxiety. But this variable couldn't predict anxiety significantly. This finding was in line with research showing that higher levels of anxiety were associated with the presence of functional language use (Sukhodolsky et al., 2008). One explanation is that children with lower functional language may have difficulty expressing their feelings. Another explanation is that language and cognitive development are interrelated. Language development research recognized that language processing is cognition and language use is distributed cognition (Deák, 2014). Again, this may be explained by relatively low cognitive levels in ASD children with lower levels of functional language acting as a buffer against developing anxiety symptoms.

The findings of the present study are promising, but there are some limitations in this study that should be considered. It is possible that impairments related to the core ASD symptoms (e.g., social withdrawal) not pure anxiety symptoms were measured with the PAZ. As a consequence, the caregivers of ASD children may not have accurately reported the anxiety symptoms in ASD children. Also, this study relied on caregiver report and caregiver perceptions of anxiety symptoms may differ from those of their child. Furthermore, caregiver characteristics such as caregiver anxiety may influence on caregiver report on children's anxiety symptoms (Bernstein et al., 2005). Despite these potential limitations of the caregiver-rating of anxiety, the study of Sukhodolsky et al. suggest that caregiver ratings could be a useful source of information about anxiety symptoms in children with ASD. Another limitation is that lack of psychometric characteristics for the ASD preschoolers of the PAZ may lead to an unreliable evaluation of anxiety. However, this scale has previously been used to measure anxiety in preschoolers with ASD and indicated to be a valid measure of anxiety levels in this population (MacLennan et al., 2020; Potter et al., 2019).

5. Conclusion

In conclusion, this study was the first research examined anxiety in Iranian children with ASD and provided preliminary findings regarding prevalence and predictors of anxiety reported by caregivers. It is evident that 57.9% of the participating preschoolers with ASD had at least one clinical anxiety symptom. No gender differences in any of the anxiety symptoms were found in this study. Age and functional language use were positively related to anxiety and ASD symptom severity was inversely correlated with anxiety. Among these variables, ASD symptom severity and age can significantly predict anxiety and ASD symptom severity was the strongest predictor of anxiety in this model. In light of current findings and contradictory findings in past research, further investigation is needed to identify additional predictors of anxiety and the role of the combination of different variables in explanation of anxiety in preschoolers with ASD. It is also suggested to examine the role of cognitive deficits in the development of anxiety in autism. Children with ASD, specifically children with more severe symptoms, have fundamental cognitive deficits that can influence their experiencing and expressing anxiety. Therefore, to provide an appropriate explanation for anxiety in children with ASD, more research is needed to determine which cognitive impairments in these individuals are related to anxiety or may influence the development of anxiety in this population. Thus, an important future direction is to provide a conceptualization of anxiety in children with autism regarding their cognitive deficits.

Data Availability and Supplementary Data

The data presented in this study are available on request from the corresponding author.

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