

# Investigating associations between cognitive empathy, affective empathy and anxiety in adolescents with autism spectrum disorder

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Autism spectrum disorder (ASD) is strongly associated with socio-cognitive impairments that may result in vulnerability to other mental health conditions, particularly anxiety disorders. This study examined the relationship between anxiety disorders and two key socio-cognitive impairments (cognitive empathy, affective empathy) in 60 adolescents (aged 11–18 years) with and without ASD. Adolescents with ASD showed cognitive empathy was negatively associated with separation anxiety disorder, whereas positive associations between affective empathy and generalized anxiety disorder, and positive marginal associations between affective empathy, social phobia, total anxiety, and separation anxiety disorder were observed. These findings suggest that cognitive and affective empathy show different patterns of associations with anxiety-related issues in ASD, and these differences should be considered for interventions and treatment programs.

**Keywords:** autism spectrum disorder; cognitive empathy; affective empathy; anxiety

## Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in socio-cognitive skills and the presence of narrow and repetitive activities (American Psychiatric Association 2013). Many individuals with ASD demonstrate higher comorbidity with other mental health conditions than non-clinical groups, and this seems to occur particularly with anxiety-related issues (Bellini 2006, Gillott *et al.* 2001, Jang *et al.* 2013, Kim *et al.* 2000, Kirsch *et al.* 2020, Moseley *et al.* 2011, Russell and Sofronoff 2005). In particular, following the analysis by van Steensel *et al.* (2011), the overall comorbidity rate of anxiety disorders in ASD is 39.6% and the individual rate of comorbidity for each anxiety disorder is as follows: generalized anxiety disorder (GAD) 15%, obsessive-compulsive disorder (OCD) 17%, social phobia (SP) and agoraphobia 17%, separation anxiety disorder (SAD) 9%, and panic disorder (PD) 2%.

Individuals with ASD have various ASD related stressors (Wood and Gadow 2010), such as bullying, peer rejection, repetitive behaviours, and impairments in empathy, executive functions, language, and social communication skills (Acker *et al.* 2018, Bellini 2006, Church *et al.* 2000, Czermainski *et al.* 2015, Eroglu

and Kilic, 2020, Harmsen 2019, Muskett *et al.* 2019, Niditch *et al.* 2012) that may contribute to the development of anxiety (Wood and Gadow 2010). But although anxiety disorders are highly common in ASD, it can be difficult to differentiate specific anxiety symptoms from core symptoms of ASD due to overlapping symptoms (Kim *et al.* 2000, Kuusikko *et al.* 2008). For example, Towbin *et al.* (2005) have found that 62% of children and adolescents who were diagnosed with anxiety and depression in the general population show evidence of ASD symptoms for at least one measure of ASD symptom severity and autism spectrum traits. Hence, this complexity of understanding the similarities of presenting anxiety symptoms in individuals with and without ASD might bring about misdiagnosis or overdiagnosis (Kim *et al.* 2000, Kuusikko *et al.* 2008, MacNeil *et al.* 2009, Wood and Gadow 2010). Of particular concern is that when assessing ASD, deficits in key socio-cognitive skills such as cognitive empathy and affective empathy (Baron-Cohen *et al.* 2013, Blair 2005) which are related to important functions including emotion recognition, social understanding, joint attention, sharing enjoyment, and social and emotional coordination (Bellini *et al.* 2007, Bellini and Peters 2008, Gutstein and Whitney 2002, Klin *et al.* 1999, Williams White *et al.* 2007), might result in vulnerability to anxiety-related issues.

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Empathy is an ability that consists of both cognitive and affective components (Baron-Cohen and Wheelwright 2004, Blair 2005, Zahn-Waxler and Radke-Yarrow 1990). While cognitive empathy (i.e. theory of mind, Grove *et al.* 2014) is defined by identifying, understanding, and reasoning own and other's mental states (e.g. beliefs, intentions, desires, etc.) in terms of explaining and predicting actions and behaviours (Baron-Cohen and Wheelwright 2004, Blair 2005, Sabbagh 2004), affective empathy is an ability to respond to and share other people's emotions appropriately (Baron-Cohen and Wheelwright 2004, Blair 2005). Individuals with ASD perform worse on cognitive empathy tasks (Bos and Stokes 2018, Girli 2017, Happé 1994, Mazza *et al.* 2014) and affective empathy tasks than control groups (Bos and Stokes 2018, Grove *et al.* 2014, Pepper *et al.* 2018). However, several studies indicate that although individuals with ASD have lower scores on cognitive empathy tasks than control groups, their performance on affective empathy tasks does not differ from that of controls (Dziobek *et al.* 2008, Mul *et al.* 2018, Rogers *et al.* 2007, Rueda *et al.* 2015).

Identifying, understanding, and reasoning others' mental states and appropriately experiencing emotions are essential skills for the social communication process (Baron-Cohen 2001). Difficulties with cognitive and affective empathy in children and adolescents result in communication problems such as difficulties in emotion recognition, reducing social understanding, increasing non-adaptive behaviour, bullying, peer rejection, and high-level social anxiety (Bellini 2004, Colonna *et al.* 2017, Pickard *et al.* 2017). In a study by Lei and Ventola (2018), the researchers found that, according to parent reports, only early theory of mind competence is a significant mediator between anxiety and broader social skills impairment in ASD. Hence, the relationship between social impairment and anxiety in ASD might not link solely to difficulties with a general theory of mind skills. A more recent study has reported that while cognitive empathy is negatively associated with SP and SAD, affective empathy is positively correlated with SP, SAD, and PD in inpatient adolescents (Gambin and Sharp 2018). Furthermore, even though difficulties in cognitive empathic skills including emotion recognition, social understanding, and social and emotional coordination (Bellini and Peters 2008, Cai *et al.* 2018, Williams White *et al.* 2007) may contribute to the development of anxiety symptoms (Wood and Gadow 2010), affective empathic skills might show different patterns of association with anxiety symptoms. As Tone and Tully (2014) proposed, although better affective empathic skills including empathic concern, and sharing and responding to others' emotions appropriately may be associated with effective social functioning, these skills can also be associated with

personal distress (self-oriented aversive reaction, Gambin and Sharp 2016, Tone and Tully 2014). According to the Tone and Tully model (2014), together with biological and environmental factors, highly empathic individuals who show difficulties in emotion regulation are at risk of developing depressive and anxiety symptoms related to excessive interpersonal guilt and personal distress. The recent study showed that emotion regulation difficulties significantly predict anxiety symptoms in ASD (Conner *et al.* 2020) and, in turn, intact affective empathic skills in ASD might be a risk factor in developing anxiety-related symptoms. Hence, cognitive empathy and affective empathy might predict anxiety symptoms with different patterns (Gambin and Sharp 2018, Tone and Tully 2014). Nevertheless, the relationship between anxiety and empathy in ASD has still not been comprehensively studied. For instance, the study by Bellini (2004) suggests that even though the findings indicate a positive relationship between social anxiety (i.e. SP) and empathy in ASD, high empathic skills are also associated with more positive social skills. However, the relationship is unclear and complex in ASD. Examining the relationship between anxiety dimensions and specific socio-cognitive skills will contribute to a better understanding of this issue and help the development of effective treatment and intervention programs for anxiety disorders in ASD.

Against this background, the main purpose of the current research was to examine the relationships between cognitive empathy, affective empathy, and anxiety dimensions in adolescents with ASD and in a typically developing (TD) group. As previous studies did not examine the link between different anxiety dimensions and two components of empathy in ASD, the current study used self-report measures to investigate anxiety with 5 subtests: separation anxiety disorder (SAD), social phobia (SP), generalized anxiety disorder (GAD), panic disorder (PD), and obsessive-compulsive disorder (OCD). Based on arguments presented previously, cognitive empathy is essential for reasoning about mental states and affective empathy plays an important role in experiencing emotions. Following the findings of Gambin and Sharp (2018), it was hypothesized that while cognitive empathy would be negatively associated with anxiety dimensions, affective empathy would be positively associated with anxiety dimensions in both ASD and TD groups. Finally, it was expected that there would also be significant differences in cognitive empathy and anxiety measures, but not in affective empathy, between ASD and TD groups.

## Methods

### Participants

The study sample consisted of 60 adolescents (as defined by the World Health Organization 2020) aged

11 to 18 years, all Turkish citizens living in Istanbul, Turkey. Of the 60 participants, 30 (mean age = 14.28) had been diagnosed with ASD, and 30 were TD participants matched for age (mean age = 14.25) with no evidence of ASD. ASD participants in the sample showed a distribution across sex of 26 males and 4 females which was similar to that observed in previous ASD samples (e.g. Eroglu and Kilic 2020, Granieri *et al.* 2020, Mazza *et al.* 2014, Rueda *et al.* 2015) and the same sex distribution was used for TD participants. In terms of economic status, inquiring formally about the income of participants can produce misleading results because it is not stable across time (e.g. Duncan and Petersen 2001). As a consequence, we used subjective socioeconomic status (SES, defined by one's own perception of one's socioeconomic status compared to other people; Huang *et al.* 2017) and this status was divided into three levels (low, average, and high) following the arguments of Worthy *et al.* 2020). A summary of the key demographic information for both groups is shown in Table 1.

Inclusion criteria for ASD participants were the diagnosis of ASD by child psychiatrists based on DSM-5 (which is the required procedure for school-aged children and adolescents in Turkey), the ability for reading and writing, and taking inclusive education in public middle or high schools. An intelligence (IQ) test (verbal comprehension, visual spatial ability, fluid reasoning, working memory, and processing speed) for ASD participants was applied as part of their medical reports approved by Guidance and Research Centres (GRC) under the Turkish Ministry of National Education (who are responsible for conducting developmental evaluations to determine the presence of disability based on DSM-5; American Psychiatric Association, 2013). Legal permission from the Turkey Ministry of National Education was obtained to collect data from public schools. All ASD participants had intelligence (IQ) test scores of 80 or above without intellectual disability (ID), however, specific data on IQ levels of participants

were not recorded due to the confidentiality policy of Guidance and Research Centres (GRC). Individuals diagnosed with ID and other psychiatric disorders were excluded. Inclusion criteria for TD participants were being middle or high school students, a matching age and sex distribution as the ASD group, and no record of any psychiatric disorder. As with ASD participants, individuals diagnosed with ID and other psychiatric disorders were excluded from the study.

## Materials

The following assessments were used to provide empirical data in the study.

### Autism spectrum screening questionnaire (ASSQ, Ehlers *et al.* 1999)

The ASSQ is a parent report used to assess the severity of ASD symptoms (the ASSQ was used because of the lack of Turkish alternatives for recently used instruments such as ADOS-2, Lord *et al.* 2012 or ADI-R, Rutter *et al.* 2003). This questionnaire consists of 27 questions for rating these symptoms as 'absent', 'mild/moderate', and 'severe', corresponding to scores ranging from low to high. The ASSQ used in the study was adapted for Turkish in 2017 by Köse *et al.* (2017) following Ehlers and colleagues (1999). The age range of the questionnaire is from 6 to 18. Cronbach's alpha value for this scale is 0.86 and test-retest reliability is  $r = 0.98$ .

### Basic empathy scale (Jolliffe and Farrington 2006)

The Basic Empathy Scale is a self-report scale for examining cognitive empathy and affective empathy. This scale consists of two subscales, one for cognitive empathy and one for affective empathy. The total number of items is 20, comprising 9 Cognitive Empathy items and 11 Affective Empathy items. For this scale, the minimum and maximum scores for cognitive empathy are 9 and 45, and the minimum and maximum scores for affective empathy are 11 and 55, respectively, lower scores corresponding to lower empathy and higher scores corresponding to higher empathy. The scale was adapted for Turkish by Topçu *et al.* (2010). Cronbach alpha coefficients for each scale range from .76 to .80. Analyses by Topçu *et al.* (2010) showed acceptable validity and reliability for this scale.

### The eyes test (Baron-Cohen *et al.* 2001a, see also Baron-Cohen *et al.* 2001b)

The Eyes Test is a performance task for emotion recognition which is widely regarded as an indicator of cognitive empathy. In this test, participants were presented with a series of 28 black and white photographs of human eyes. For each photograph, participants were asked to choose which of 4 words best describes what the person in the photograph is feeling or thinking. The

**Table 1. Demographic information.**

	ASD ( <i>n</i> = 30)	TD ( <i>n</i> = 30)	<i>p</i>
Age (M (SD))	14.28 (2.14)	14.25 (2.06)	$p > .10$
ASSQ (M (SD))	23.27 (9.75)	1.87 (1.87)	$p < .001$
Sex (% ( <i>n</i> ))			$p > .10$
Male	86.7 % (26)	86.7 % (26)	
Female	13.3 % (4)	13.3 % (4)	
Education (% ( <i>n</i> ))			$p > .10$
Middle School	46.7 % (14)	30.0 % (9)	
High School	53.3 % (16)	70.0 % (21)	
Economic Status (% ( <i>n</i> ))			$p > .10$
Low	3.3 % (1)	10.0 % (3)	
Average	76.7 % (23)	66.7 % (20)	
High	13.3 % (4)	20.0 % (6)	

Note. ASD = Autism Spectrum Disorder, TD = Typically Developing, M = Mean, SD = Standard Deviation, ASSQ = Autism Spectrum Screening Questionnaire. Three parents declined to provide information about economic status.

version we used was adapted for Turkish by Girli (2014). The Cronbach alpha internal consistency coefficient for this test is greater than .70.

### The revised child anxiety depression scale – children version (RCADS – CV, Chorpita *et al.* 2005)

RCADS is a self-report scale to examine the anxiety and depression levels of children and adolescents (i.e. primary, middle, and high school students, Gormez *et al.* 2017). In the present study, an anxiety subscale consisting of 37 items was used. The subscale corresponds to SAD (7 items), SP (9 items), GAD (6 items), PD (9 items), and OCD (6 items). It is a 4-point scale (0 = never, 1 = sometimes, 2 = often, and 3 = always). The version we used was adapted for Turkish by Gormez *et al.* (2017). The minimum and maximum scores of total anxiety are 0 and 111, respectively, lower scores corresponding to lower anxiety and higher scores corresponding to higher anxiety. For this scale, inter-scale reliability with Cronbach's Alpha is .95, and coefficients for RCADS-CV subscales range from .75 to .86.

### Procedure

All participants attended public middle schools and high schools in Istanbul. Written informed consent was provided by participants and their parents and all participants and parents confirmed their willingness to participate. During the data collection part of the study, participants were required to complete the necessary assessments and questionnaires, and this took 20–30 min. These procedures are described in detail in the *Materials* section. All participants were accompanied by a researcher during the data collection procedure. Parents completed the demographic information form and the Autism Spectrum Screening Questionnaire (ASSQ, Ehlers *et al.* 1999). Number codes were used for participants, and participants and parents were informed that all data would remain confidential and anonymous for research purposes.

### Data analyses

The data obtained using these measures were analyzed using SPSS 25.0 for Windows. Pearson bivariate correlations were conducted to examine the relationship between cognitive empathy, affective empathy, and anxiety dimensions. The normality indicators (skewness and kurtosis) are between 1 and  $-1$ ; therefore, parametric tests were carried out (Hair *et al.* 2013). The alpha level for testing statistical significance was set at .05 and a marginal significance rate up to .06 is also presented for information. (These values are conservative relative to previous studies that have adopted as much as .10 as an indication of significance for sample sizes similar to the sample size used in the current study, e.g.

Schumm *et al.* 2013, Hsu *et al.* 2021). In order to examine group differences, independent t-tests were conducted, and Cohen's  $d$  was used to calculate effect size (Cohen 1988). An overall omnibus analysis using Pearson bivariate correlation for the ASD group showed no relationship between cognitive empathy, affective empathy, total anxiety, PD, OCD, and SP but showed significant relationships between cognitive empathy and SAD, and between affective empathy and GAD (see Table 2). For further relationships and predictions for the ASD group, multiple linear regression analyses were conducted to examine the predictors of SAD and GAD, and these analyses are reported in the Results section.

## Results

### Correlation analyses

Pearson correlation coefficients examined the relationship between anxiety dimensions, cognitive and affective empathy subscales, and the Eyes Test scores for each of the ASD and TD groups (see Table 2). In the ASD group, affective empathy and generalized anxiety disorder were positively correlated ( $r(30) = .37, p < .03$ ). Affective empathy and SP were marginally positively correlated ( $r(30) = .34, p = .056$ ), affective empathy and total anxiety were also marginally positively correlated ( $r(30) = .34, p = .06$ ), and SAD and cognitive empathy were negatively correlated ( $r(30) = -.44, p < .01$ ).

### T-test analysis

In order to investigate group differences, an independent t-test was conducted on results of cognitive and affective empathy, the Eyes Test, and anxiety dimensions. Significant differences were found across ASD and TD groups for cognitive empathy ( $t(58) = -2.092, p < .05$ ), the Eyes Test ( $t(58) = -5.139, p < .001$ ), affective empathy ( $t(58) = -2.989, p < .01$ ), SAD ( $t(58) = -2.811, p < .01$ ) and GAD ( $t(58) = 2.240, p < .05$ ). However, no significant differences were found between ASD and TD groups for total anxiety ( $t(58) = -.376, p > .05$ ), SP ( $t(58) = -.559, p > .05$ ), PD ( $t(58) = -.240, p > .05$ ), and OCD ( $t(58) = .311, p > .05$ ), see Table 3.

### Multiple linear regression analyses

According to the multiple regression model of GAD in ASD, the model was not significant,  $F(5, 24) = 2.25, p = .08$  with an  $R^2$  of .32. The multiple regression analysis was run to predict SAD in ASD from age, sex, cognitive empathy, affective empathy, and Eyes test. The model was significant,  $F(5, 24) = 3.69, p = .01$  with an  $R^2$  of .44 (see Table 4).

**Table 2. Pearson correlation between variables.**

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Cognitive Empathy	–	.34	.40*	.03	–.05	–.44**	–.04	.28	.06	.15	.20
2. Affective Empathy	.02	–	.28	.34 <sup>b</sup>	.35 <sup>a</sup>	.03	.37*	.29	.18	.30	.10
3. Eyes Test	.29	–.12	–	–.09	.17	–.22	.11	.07	.10	.01	–.19
4. Anxiety	–14	.00	–.37*	–	.82***	.38*	.84***	.85***	.83***	.21	.04
5. SP	–.21	–.05	–.21	.78***	–	.05	.67***	.55***	.65***	.27	–.12
6. SAD	–.13	–.12	–.34	.80***	.48***	–	.27	.30	.14	–.42*	.08
7. GAD	–.03	.07	–.33	.86***	.66***	.49***	–	.60***	.63***	.40*	.11
8. PD	–.09	.16	–.41*	.86***	.53***	.64***	.73***	–	.70***	.11	.12
9. OCD	–.18	–.11	–.19	.81***	.52***	.69***	.67***	.54***	–	.27	.00
10. Age	.32	–.47**	.09	.17	.12	.12	.23	.04	.25	–	–.05
11. Sex	.21	–.11	–.05	–.07	–.03	.19	–.29	–.10	–.11	–.05	–

Note. Correlations for ASD are presented above the diagonal, for TD group is below the diagonal. Anxiety = Total Anxiety Score, SP = Social Phobia, SAD = Separation Anxiety Disorder, GAD = Generalized Anxiety Disorder, PD = Panic Disorder, OCD = Obsessive Compulsive Disorder, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  <sup>a</sup> $p = .056$ , <sup>b</sup> $p = .06$ .

**Table 3. Group comparison.**

	ASD (n = 30) M (SD)	TD (n = 30) M (SD)	d
Cognitive Empathy	32.93 (6.55)*	36.17 (5.35)*	–.54
Affective Empathy	32.23 (4.04)**	35.37 (4.08)**	–.78
Eyes Test	17.00 (3.19)***	20.83 (2.54)***	–1.34
Anxiety	37.57 (19.63)	39.50 (20.14)	–.09
SP	10.77 (6.52)	11.63 (5.43)	–.14
SAD	3.57 (3.44)**	7.27 (6.33)**	–.73
GAD	7.77 (4.64)*	5.13 (4.46)*	.58
PD	7.30 (6.28)	7.63 (9.75)	–.06
OCD	8.17 (4.34)	7.83 (3.94)	.08

Note. ASD = Autism Spectrum Disorder, TD = Typically Developing, M = Mean, SD = Standard Deviation, Anxiety = Total Anxiety Score, SP = Social Phobia, SAD = Separation Anxiety Disorder, GAD = Generalized Anxiety Disorder, PD = Panic Disorder, OCD = Obsessive Compulsive Disorder, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

**Table 4. Multiple linear regression predicting SAD in ASD.**

	B	SE B	β	R	R <sup>2</sup>	p
				.66**	.44**	$p = .013$
Age	–.71	.26	–.44**			
Sex	.96	1.66	.09			
Affective Empathy	.30	.15	.35 <sup>a</sup>			
Cognitive Empathy	–.25	.10	–.47*			
Eyes Test	–.12	.20	–.11			

Note. \* $p < .05$ , \*\* $p = .013$ , <sup>a</sup> $p = .057$ .

### Discussion

This study investigated the relationships between several anxiety dimensions (i.e. SAD, SP, GAD, PD, and OCD) and affective and cognitive empathy in adolescents with ASD, compared to a typically developing control group (TD). The results offered some support for the hypotheses that, for participants with ASD, affective empathy was positively associated with GAD and showed a marginally significant relationship with SP and total anxiety, whereas cognitive empathy was negatively associated with SAD in the ASD group. Moreover, it was hypothesized that cognitive empathy and anxiety dimensions would differ significantly between ASD and TD, but not for affective empathy. The findings indicate that participants with ASD displayed lower cognitive empathic skills than the TD group, but a significant difference was also found for

affective empathy. Regarding anxiety dimensions, differences between the ASD and TD groups were found only for SAD and GAD. While participants with ASD showed higher scores for GAD than the TD group, the TD group demonstrated higher SAD than the ASD group, but no significant differences for other anxiety measures were found.

The positive relationships observed between affective empathy and GAD, and marginally between affective empathy, SP, and total anxiety are consistent with the previous literature concerning inpatient adolescents and individuals with social phobia (Gambin and Sharp 2018, Tibi-Elhanany and Shamay-Tsoory 2011). But now this study shows that these associations are also present amongst the ASD population. These findings suggest that, for participants with ASD, experiencing their own aversive (negative) emotional states and the emotional states of others, may result in alertness and sensitivity to what other people feel, and this might, in turn, increase their own anxiety symptoms. Even though affective empathic skills are important for social functioning (Bellini 2004), as Tone and Tully (2014) proposed that empathic concern and sharing others' emotions could be 'risky strengths' due to personal distress and interpersonal guilt that might lead to internalizing disorders such as anxiety. Specifically, a high level of affective empathy might increase the likelihood of anxiety disorders for individuals with ASD who have already shown difficulties in emotion regulation (Cai *et al.* 2018). Together with a biological predisposition to emotion regulation problems, aversive environmental factors (as stated by Tone and Tully 2014) such as peer rejection and bullying in ASD (Pickard *et al.* 2017) can also contribute to positive associations between affective empathy and internalizing disorders such as anxiety. In addition, individuals with ASD may be aware of how people evaluate them, and this too may create anxiety (Bellini 2004), and experiencing different negative emotions, including shame or guilt, might be devastating (Gambin and Sharp 2018). The negative relationship we observed between cognitive empathy and SAD is also in line with the previous literature concerning

typically developing children and inpatient adolescents (Caputi and Schoenborn 2018, Gambin and Sharp 2018) but now shows in adolescents with ASD that difficulties in emotion recognition and regulation, understanding, and interpretation of own and others' mental states (Hezel and McNally 2014, Salkovskis *et al.* 1998) might predict SAD, in particular. However, the literature is limited for each anxiety dimension in the ASD population and, therefore, more research is needed to investigate these arguments.

In terms of group differences in affective and cognitive empathy, the results we obtained are in line with previous research (Bos and Stokes 2018, Grove *et al.* 2014, Pepper *et al.* 2018) but contradictory results have also been reported for affective empathy (Dziobek *et al.* 2008, Mazza *et al.* 2014, Mul *et al.* 2018, Rueda *et al.* 2015). These contradictions might result from using self-report questionnaires, and lack of objective measures such as psychophysiological recording (Trimmer *et al.* 2017) and performance tasks (e.g. Multifaceted Empathy Task by Dziobek *et al.* 2008) in measuring affective empathy. Furthermore, in contrast to earlier findings concerning differences in anxiety dimensions (Bellini 2004, Gillott *et al.* 2001, Kuusikko *et al.* 2008, van Steensel *et al.* 2013), only measures of GAD in the current study showed higher scores in the ASD group than the TD group. According to the theoretical model of Wood and Gadow (2010), anxiety might be positively associated with ASD due to ASD symptoms, the severity of ASD symptoms, and the consequences of ASD symptoms. The participants in the current research consisted of individuals with ASD without ID and, therefore, it might be interpreted that the ASD symptoms of these individuals were not as severe and, in turn, these participants might not show severe anxiety-related problems.

However, the current study did not support the relationships previously reported between affective empathy and total anxiety, and between affective empathy and PD, or the relationships previously reported between cognitive empathy and measures of total anxiety, SP, and PD for non-ASD individuals (Caputi and Schoenborn 2018, Gambin and Sharp 2018, Hezel and McNally 2014, Tibi-Elhanany and Shamay-Tsoory 2011). These inconsistent results may exist due to different target populations. Previous studies were carried out with inpatient adolescents and individuals with SP (Gambin and Sharp 2018, Hezel and McNally 2014, Washburn *et al.* 2016), whereas the sample of the current study was adolescents with ASD and TD. It might be expected that inpatient adolescents and individuals who were diagnosed with any anxiety disorder have higher scores for anxiety measures than the autistic group without ID and the TD group in the current study. Moreover, less awareness of their impairments and emotional experiences for the ASD group (Losh

and Capps 2006) might be another possible explanation for the contradictory findings with literature concerning inpatient adolescents and individuals with social phobia for cognitive and affective empathy. In addition, contrary to findings obtained using the self-report questionnaire, there was no significant relationship between cognitive empathy performance task (i.e. Eyes Test) and SAD for the ASD group. Regarding the involvement of emotions in the performance task (i.e. Eyes Test), the use of performance tasks including both emotion (e.g. Eyes Test) and non-emotion tasks (e.g. Director Task by Dumontheil *et al.* 2010), and self-report questionnaires for measuring cognitive empathy could provide a more complete understanding of the relationship between anxiety dimensions and cognitive empathy.

### **Clinical implications**

Focusing on empathic skills may be important for developing effective treatment and intervention for reducing anxiety disorders in individuals with ASD. However, it is important to consider the different associations of affective and cognitive empathy when developing and examining treatment and intervention programs for both clinical and non-clinical groups. The current study suggests that only the enhancement of affective empathy in individuals with ASD without any emotion regulation skills training might not be an effective treatment and intervention for specific anxiety disorders (Tone and Tully 2014). However, enhancing emotion regulation skills and cognitive empathic skills, including joint attention (Goods *et al.* 2013), perspective-taking, and emotion recognition (Didehbani *et al.* 2016, Kandalaf *et al.* 2013, Patriquin 2019), may be a beneficial strategy for reducing anxiety-related issues in TD and ASD groups.

### **Limitations and future directions**

This study also raises a number of potential limitations and routes for further development in this area of research. Although it is known that females show higher anxiety and anxiety-related symptoms than males (Kessler *et al.* 1994), the sex ratio in the general ASD population is 3:1 male to female (Loomes *et al.* 2017). Therefore, even though the rate of anxiety symptoms might be affected by sex ratio, the sex ratio of the current study is in line with other autism research (e.g. Eroglu and Kilic 2020, Granieri *et al.* 2020, Mazza *et al.* 2014, Rueda *et al.* 2015). Another potential limitation in this research is that adolescents who have ASD without ID were recruited specifically for this study, so the generalizability of these findings may not extend across the entire ASD population. In addition, these relationships need further investigations using various additional measures including self-report, parent-report, teacher-report, and performance tasks

(Dziobek *et al.* 2008, Hezel and McNally 2014, Rueda *et al.* 2015) and examining differences in cognitive empathy competency (Lei and Ventola 2018) may be a useful addition to future studies of individuals with ASD and non-clinical populations.

Furthermore, despite using the performance task (i.e. Eyes Test), computer-based performance tasks such as Director Task (Dumontheil *et al.* 2010), Multifaceted Empathy Task (Dziobek *et al.* 2008), and The Movie for the Assessment of Social Cognition (Dziobek *et al.* 2006) might be especially useful and provide more information for evaluating both components of empathy.

## Conclusion

In summary, this is the first study to investigate the relationship between two components of empathy (affective and cognitive) and various anxiety dimensions in ASD. The main goal of the study was to examine the link between affective empathy, cognitive empathy, and anxiety dimensions in adolescents with ASD and the findings suggest that affective empathy and cognitive empathy can both be significant factors that influence the level of anxiety in ASD. In terms of treatment and intervention programs, clinicians should consider the role of affective and cognitive empathy in producing different associations with anxiety dimensions. Indeed, although anxiety might be associated with the worst core symptoms of ASD, the appropriate use of affective and cognitive empathic skills may help individuals with ASD to improve the quality of their life.

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## Data availability statement

The data are not publicly available due to privacy/ethical restrictions.

## Disclosure statement

The authors declare that they have no conflict of interest.

## Ethical approval

Approval from the ethical committee of Ibn Haldun University was obtained for this study (No. 2019/23-2). Legal permission from the Turkey Ministry of National Education was obtained to collect data from public schools (No.59090411-44-E.1182577).

## Informed consent

Informed consent was obtained from participants and all participants confirmed they were participating voluntarily.

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