



# Parents' personality, parenting stress, and problem behaviors of children with special needs in China before and during the COVID-19 pandemic

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## Abstract

The positive predictive effect of children's problem behaviors on parenting stress has been verified to some extent, but research on parents of children with special needs remains insufficient. Moreover, the role of parental personality traits in the relationship between children's problem behaviors and parenting stress, and whether it differs from before the COVID-19 pandemic, remains unclear. Accordingly, in this study, online questionnaires were used to survey parents of children with autism and intellectual disabilities in China – 337 parents before and 604 during the COVID-19 pandemic – to explore the relationship between problem behaviors in the children and parenting stress as well as the moderating effect of parents' personality. The results showed that problem behaviors of children with autism and intellectual disabilities had a positive predictive effect on parenting stress. However, there was no significant difference in this effect before and during the pandemic. In addition, the relationship between children's problem behaviors and parenting stress was moderated by the Agreeableness and Neuroticism of the parents, but only during COVID-19 pandemic. The research results suggest that, during the pandemic when facing problem behaviors of children with autism or intellectual disabilities, positive personality characteristics such as Agreeableness have a protective effect on parenting stress. By contrast, negative personality characteristics such as Neuroticism are risk factors. The study results provide evidence from special groups regarding the role of parents' personalities in the parent – child interaction and the parenting stress models.

**Keywords** Autism · Intellectual disability · Problem behaviors · Parenting stress · Personality characteristic · COVID-19 pandemic

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## Introduction

Since the first case of COVID-19 infection was reported in Wuhan in December 2019, over 452 million confirmed cases and over 6.0 million deaths have been reported globally (World Health Organization, 2022). During the initial stages of the pandemic, schools were not adequately equipped to run online classes following government orders for school closure to prevent the spread of the virus. This situation affected more than 1.5 billion children and young people globally. Up to 90% of them were students (World Health Organization, 2020), causing more stress for parents (Adams et al., 2021; Brown et al., 2020; Kurata et al., 2021; Wu & Xu, 2020). Parenting stress is the pressure related to fulfilling parental obligations and participating in parent-child interaction. It is closely correlated with some internal and external factors such as individual characteristics

and the environment (Abidin, 1992). Studies on parents of non-disabled children (Baker et al., 2003; Krahe et al., 2015; Neece et al., 2012), and disabled children (Davis & Neece, 2017; Osborne & Reed, 2009; Thomas et al., 2018) show that children's problem behavior is a significant source of parenting stress, and the greater the extent of children's problem behaviors, the greater the stress felt by parents. Some studies have found that children with special needs are at heightened risk of being forced out of school education and routine rehabilitation due to the closure of schools, consequently, their behavioral problems increased and development regressed (Singh et al., 2020). Due to school closures, parents of children with special needs faced greater challenge than those of typically developing children (Hoofman & Secord, 2021). There are only a few studies on the relationship between problem behaviors of children with autism and intellectual disabilities and their parent's parenting stress. As research is seldom focused on parent's personalities and pandemic-related changes, the current study surveyed Chinese parents of children with autism and intellectual disabilities in Guangdong Province to explore the relationship among children's problem behaviors, parents' personalities, and parenting stress before and during the COVID-19 pandemic.

### **Relationship between problem behaviors of children with autism and intellectual disabilities and parenting stress**

Children's problem behavior is the internalized and externalized behavior incompatible with age in the children's growth process. These behaviors mainly manifested as internalized problem behaviors such as anxiety, depression, and withdrawal and externalized problem behaviors such as aggression and discipline violations (Achenbach, 1991). They are often related to a series of adverse events, such as peer rejection, delayed social-cognitive development, increased academic problems, and difficulties in emotional regulation (Connell & Goodman, 2002). According to Mash and Johnston's (1983) parent-child interaction stress model, parents, children, and the environment jointly act over parents' parenting stress. Children's problem behaviors are a primary source of parenting stress (Neece et al., 2012). The more serious the children's problem behaviors, the greater the parenting stress (Baker et al., 2003; Krahe et al., 2015).

Liu et al. (2021b) found that the incidence of problem behaviors in school-age children during the pandemic was between 4.7% and 10.3% in China. In Japan, Takahashi and Honda (2021) reported that 22.7% of children aged 1–12 years had clinical-level behavioral problems, and children with neurodevelopmental disorders accounted for

the highest proportion (35.8%). Parents mentioned several adverse psychological effects caused by the pandemic, including health concerns and greater childcare pressures (Chu et al., 2021). Parents of children with special needs were more negatively affected due to their children's problem behaviors (Hoofman & Secord, 2021), especially parents of children with neurodevelopmental disorders (Bentenuto et al., 2021; Singh et al., 2020) and autism (Chen et al., 2020). In one study, parents of children with neurodevelopmental disabilities reported significantly higher stress than those of typically developing children did; a child's condition (stress related to child's clinical disorder; distress associated with management difficulties surrounding child behavior) was a determinant of parenting stress (Siracusano et al., 2021). According to Benteuto et al. (2021), owing to the reduction in rehabilitation interventions during the pandemic, problem behaviors in children with neurodevelopmental disorders and their parents' stress levels increased significantly.

Similarly, Panjwani et al. (2021) pointed out that during the pandemic, most parents reported an increase in problem behaviors in children with autism spectrum disorder, such as attention issues, argumentativeness, hyperactivity, and irritability. The increase in the problem behaviors of autistic children significantly predicted parents' stress and emotional health (Alhuzimi, 2021). During this period, parents of autistic children experienced higher levels of anxiety (Ersoy et al., 2020) and parenting stress (Alhuzimi, 2021; Althiabi, 2021). A review of caregiver's mental health during COVID-19 demonstrated increases in stress, mental health-related symptoms, and demands placed on parents (Kwon et al., 2022; Lee et al., 2021). As problem behavior in exceptional children has increased during the COVID-19 pandemic, this study hypothesized that the relationship between problem behavior in children with autism and intellectual disabilities and their parents' stress will have changed during the pandemic.

### **Moderating effect of personality**

It has been well documented that the COVID-19 pandemic led to an increase in internalizing and externalizing symptoms in children and adolescents with neuropsychiatric disorders (Bentenuto et al., 2021; Operto et al., 2022; Singh et al., 2020), resulting in a potential increase of care demand and parenting stress (Lee et al., 2021). According to Abidin's (1992) parent-child stress model, social, environmental, behavioral, and developmental variables all have effects on parenting stress and children's behavior, which could be moderated by parents' characteristics related to the parenting role. There is substantial evidence that parental personality characteristics are significant

predictors of parenting stress and are associated with children's problem behaviors (Leonardi et al., 2021; Park & Chang, 2013). Studies have shown that preschool children's behavioral development may be related to the mother's personality characteristics (Li et al., 2016). Parents of children with problem behaviors have higher Neuroticism scores (Han et al., 2010). Parents of children with intellectual disabilities (Mirsaleh et al., 2011) and autism (Snow & Donnelly, 2016) reported significantly higher Neuroticism scores than those of typically developing children. In addition, a longitudinal study has shown that Neuroticism at age 33 predicts high parenting stress and Extraversion at the same age predicts low parenting stress at age 42 (Rantanen et al., 2014). Notably, Vermaes et al. (2008) studied stress in parents of children with spina bifida (a Chronic disease that covers a wide array of spinal cord malformations and causing a range of functional impairments in individuals). They found that personality characteristics are a stronger predictor of parenting stress compared to the children's physical dysfunction. These findings suggest that parents' personality characteristics may relate to parenting behavior and then children's behavior.

Personality may be a protective or risk factor for one's health. Researchers have established that Conscientiousness is a predictor of better health outcomes across the lifespan, while Neuroticism is a risk factor (Smith, 2006). Previous studies have established that during the pandemic, individuals with certain personality traits (e.g., Openness, Extraversion, and Agreeableness) were more receptive to public health initiatives (Choi et al., 2022; Han et al., 2010; Milad & Bogg, 2021). Regardless of the COVID-19-related stressors, individuals with high levels of Neuroticism are more likely to perceive higher stress (Bellintier et al., 2021) and distress (Starcevic & Janca, 2022). As mentioned above, during the pandemic, problem behaviors of children with special needs increased and their caregivers faced additional parenting pressure. While some research has indicated that the relationship between children's problem behaviors and their parents' parenting stress may be moderated by parents' personality characteristics, there is still very little research on this topic, especially regarding parents of children with disabilities, let alone comparing the role of personality traits before and during the pandemic.

## Present study

Based on the preceding research, it is clear that the COVID-19 pandemic has brought significant challenges to children and their parents. The positive predictive effect of children's problem behaviors on parenting stress has been verified to some extent, but research on parents of children with special needs remains insufficient. Most studies only illustrate

the predictive role of problem behavior instead of providing a systematic understanding of what factors moderate the effects between these variables. Furthermore, studies have demonstrated that individual psychology and behavior differ according to individual personality traits under pandemic conditions. The role of parental personality traits in the relationship between children's problem behaviors and parenting stress, and whether it differs from before the pandemic, remains unclear. This study therefore uses the Conners Parent Symptom Questionnaire, Parenting Stress Index—Short Form-15, and Neuroticism Extraversion Openness Five-Factor Inventory to survey parents of children with autism or intellectual disabilities in China before and during the COVID-19 pandemic, and investigates the relationship between these variables. The following hypotheses were proposed.

**Hypothesis 1:** There is a positive relationship between the problem behaviors of children with autism or intellectual disabilities and parenting stress both before and during the pandemic. The degree of the correlation may differ.

**Hypothesis 2:** The personality of parents of children with autism and intellectual disabilities could moderate the relationship between children's problem behaviors and parenting stress. The moderating effect will differ before and during the COVID-19 pandemic.

## Materials and methods

### Participants

The original project intended to study the moderating role of parents' personality in the relationship between problem behaviors of children with autism and intellectual disabilities and their parents' parenting stress. The participants were recruited before the COVID-19 outbreak from October to November 2019, through special schools in Guangzhou, Zhaoqing, and Yangjiang of Guangdong Province (enrolling children with mental development disabilities, among which were primarily those with intellectual disabilities and autism), completed an online questionnaire through new media platforms such as WeChat and QQ. During the COVID-19 period (February 2020), the study was renewed and parents (also recruited through special schools in Guangdong Province) were asked to fill an online questionnaire in the same way. The parents in this study had at least one child diagnosed with autism or intellectual disability enrolled in special schools. All the children have been diagnosed by qualified professional doctor according to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013)

diagnostic criteria. This study was approved by the ethics committee of the corresponding author's university (Protocol Numbers: GZHU2020005, GZHU2020004).

A total of 416 questionnaires were received before the pandemic (Sample 1). The data with incorrect parents' and children's ages (the permit range of parents' age is 22–60, children's age is 3–18) (21), disorder types (not autism nor an intellectual disability) (31), and the scores on all the questionnaires beyond three standard deviations from the mean (27) were excluded. Valid data on a total of 337 parents were subsequently analyzed. Among them, 84 (25%) were male parents ( $M_{\text{age}} = 41.33$ ,  $SD = 5.72$ ) and 253 (75%) were female parents ( $M_{\text{age}} = 39.32$ ,  $SD = 5.11$ ). Of the participants, 188 (56%) were parents of children with autism (children's  $M_{\text{age}} = 10.82$ ,  $SD = 2.72$ ), and 149 (44%) were parents of children with intellectual disabilities (children's  $M_{\text{age}} = 11.26$ ,  $SD = 3.28$ ).

A total of 669 questionnaires were received during the pandemic (Sample 2), excluding data with answering times that were too short or long (the permit range of answering time is 300 seconds–6000 seconds) (5), obviously wrong parents' and children's ages (the permit range of parents' age is 22–60, children's age is 3–18) (40), and questionnaires scores of all questionnaires beyond three standard deviations from the mean (20). A total of 604 valid data remained. Among them, 124 (21%) were male parents ( $M_{\text{age}} = 42.53$ ,  $SD = 5.35$ ) and 480 (79%) were female parents ( $M_{\text{age}} = 40.46$ ,  $SD = 5.35$ ). The sample included 238 (39%) parents of children with autism (children's  $M_{\text{age}} = 11.51$ ,  $SD = 3.31$ ), and 366 (61%) were parents of children with intellectual disabilities (children's  $M_{\text{age}} = 11.94$ ,  $SD = 2.89$ ). The test of the distribution of the two samples found that parents' gender distribution has no significant differences ( $\chi^2 = 2.43$ ,  $p = 0.12$ ); however, parents' age ( $t = 2.89$ ,  $p < 0.005$ ), children's gender ( $\chi^2 = 3.84$ ,  $p = 0.05$ ), children's age ( $t = 3.66$ ,  $p < 0.005$ ), and children's disorder types ( $\chi^2 = 17.49$ ,  $p < 0.001$ ) were significantly different. These demographic variables were

controlled in the following analysis. The detailed sample characteristics is shown in Table 1.

## Measures

### Conners' parent symptom questionnaire, PSQ

Conners compiled the PSQ. It is considered suitable for assessing children's problem behaviors (Su et al., 2001). The scale comprises 48 questions, covering five dimensions: conduct problems, learning problems, psychosomatic, hyperactivity/impulsivity, and anxiety. A 4-point scoring scale was used, and the options ranged from 0 to 3 points, representing "none" to "many". The internal consistency reliability coefficients (Cronbach's  $\alpha$ ) were 0.89 in Sample 1 and 0.92 in Sample 2.

### Parenting stress index—short form-15, PSI-15

Abidin (1990) compiled the PSI-15. It was revised by Luo et al. (2019). They created a Chinese version. The scale comprises 15 questions, covering three dimensions: parenting distress, parent-child dysfunctional interaction, and difficult children. A 5-point scoring scale was used, with options ranging from 1 to 5, representing "strongly disagree" to "strongly agree". The higher the total score, the higher the pressure felt by parents. The internal consistency reliability coefficients (Cronbach's  $\alpha$ ) were 0.90 in Sample 1 and 0.92 in Sample 2.

### Neuroticism extraversion openness five-factor inventory, NEO-FFI

McCrae and Costa (1989) created the NEO-FFI scale. Yao and Liang (2010) revised it to include 60 items. It measures the five personality traits of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. A 5-point scoring scale was used, with options ranging from 1 to 5, representing "strongly opposed" to "strongly support". In this study, the Cronbach's  $\alpha$  coefficient of each dimension in Sample 1 was 0.85, 0.76, 0.44, 0.72, and 0.60, respectively. In Sample 2, these values were 0.82, 0.73, 0.41, 0.73, and 0.78, respectively. Owing to its limited reliability, the Openness subscale was excluded from the analysis.

## Procedure and data analysis

The online questionnaire was composed of six parts: The first part was a consent form and only those who agreed to take part in the survey could continue to complete the following questionnaire. The second part was

**Table 1** Sample Characteristics of the two samples

	Sample1	Sample2	$t/\chi^2$	$P$	
Parent	Male	84	124	2.43	0.12
	Female	253	480		
	Age( $M \pm SD$ )	39.82 $\pm$ 5.34	40.89 $\pm$ 5.47	2.89	<0.005
Child	Male	253	417	3.84	0.05
	Female	84	187		
	Age( $M \pm SD$ )	11.02 $\pm$ 2.99	11.77 $\pm$ 3.02	3.66	<0.005
	Autism	188	238	17.49	<0.001
	Intellectual disability	149	336		

a demographic scale consisting of sex, age, education, employment status, and a child's sex, age, disorder types, and so on. The third to fifth parts were the three scales mentioned in *Measures*. The link to the online questionnaire was sent to students' parents through WeChat group and QQ group by principals or administrative staff of special schools.

This study primarily used SPSS25.0 for data management, descriptive statistical analysis and Pearson correlation analysis. The Hayes and Watson (2013) SPSS Macro program was used to test the moderating effect. Mplus8.3 was used to conduct construct validity test and group comparison on parents of children with different disorder types and on the two samples. The gender and age of parents and children were used as control variables in the analysis of moderating effect and group comparison. All predictive variables were standardized. All tests were performed at the two-tailed level, and  $p \leq 0.05$  was considered significant.

## Results

### Control and test of common-method variance

As data in this study were derived through self-reports, common-method variance may have affected the results. In data collection, anonymous participation, reverse item scoring, and balanced scale order were used for control (Zhou & Long, 2004). Harman's single-factor test was applied to the data collected before and during the pandemic. In addition, unrotated factor analysis was performed. The data before the pandemic showed that the

total number of factors with eigenvalues greater than 1 was 27. The amount of variation explained by the first factor was 14.43%. The data collected during the pandemic had 22 factors with eigenvalues greater than 1. The amount of variation explained by the first factor was 16.46%, less than the critical benchmark of 40%. Therefore, there was no serious common method variance in the study data.

### Preliminary analysis

As reported by parents, a preliminary descriptive statistical analysis was performed of the children's problem behavior, parenting stress, Agreeableness, and Neuroticism. Pearson's correlation was used to analyze the relationship between the variables. Tables 2 and 3 show these results.

The correlation analysis results indicate a significant positive correlation between problem behaviors and parenting stress. In addition, the two variables are significantly positively correlated with parents' Neuroticism and are significantly negatively correlated with Extroversion, Conscientiousness, and Agreeableness. It also shows that the correlation between agreeableness and conscientiousness is much stronger during the pandemic (0.65) than before the pandemic (0.22).

### Predictive effect of problem behaviors on parenting stress

The study used parenting stress as an outcome variable, problem behaviors as a predictive variable, and parents' and children's genders and ages as control variables to explore the relationship between problem behaviors and

**Table 2** Descriptive statistics and correlation analysis before COVID-19 ( $n = 337$ )

	1	2	3	4	5	6	7	8	9	10
1. Parents' gender	–									
2. Parents' age	–	–								
3. Children's gender	–	–	–							
4. Children's age	–	–	–	–						
5. Problem behaviors	0.05	–0.06	0.05	–0.12*	–					
6. Parenting stress	0.10	–0.01	0.04	–0.04	0.58***	–				
7. Neuroticism	–0.02	0.01	0.07	–0.07	0.25***	0.52***	–			
8. Extraversion	–0.09	–0.18**	0.05	–0.04	–0.17**	–0.28***	–0.53***	–		
9. Agreeableness	–0.13*	0.01	–0.04	0.06	–0.09	–0.24***	–0.42***	0.37***	–	
10. Conscientiousness	0.02	–0.04	0.00	–0.02	–0.02	0.02	–0.43***	0.42***	0.22***	–
<i>M</i>	0.25	39.82	0.75	11.02	1.78	2.59	2.85	3.25	3.77	3.36
<i>SD</i>	–	5.34	–	2.99	0.37	0.74	0.63	0.49	0.41	0.36

Gender was a dummy variable, male = 1, female = 0, mean indicates the proportion of male; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$



**Table 3** Descriptive statistics and correlation analysis during COVID-19( $n=604$ )

	1	2	3	4	5	6	7	8	9	10
1. Parents' gender	–									
2. Parents' age	–	–								
3. Children's gender	–	–	–							
4. Children's age	–	–	–	–						
5. Problem behaviors	–0.03	–0.04	0.03	–0.12**	–					
6. Parenting stress	–0.02	0.02	0.03	–0.07	0.58***	–				
7. Neuroticism	–0.07	–0.07	0.03	–0.07	0.30***	0.47***	–			
8. Extraversion	–0.05	–0.02	–0.03	0.05	–0.23***	–0.34***	–0.59***	–		
9. Agreeableness	–0.12*	0.13*	–0.09*	0.12**	–0.13**	–0.27***	–0.46***	0.45***	–	
10. Conscientiousness	–0.08*	0.06	0.00	0.10*	–0.15***	–0.28***	–0.45***	0.59***	0.65***	–
<i>M</i>	0.21	40.89	0.69	11.77	1.61	2.39	2.77	3.28	3.71	3.57
<i>SD</i>	–	5.47	–	3.07	0.42	0.78	0.58	0.46	0.43	0.46

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

parenting stress. The results showed that problem behaviors had a significant positive predictive effect on parenting stress before ( $\beta = 0.58, p < 0.001$ ) and during the pandemic ( $\beta = 0.59, p < 0.001$ ). Furthermore, there was no significant difference before and during the pandemic ( $Wald = 0.38, p = 0.54$ ). This result partly verified the Hypothesis 1: Children's problem behaviors positively predicted parents' parenting stress. The relationship is robust and is not affected by pandemic-related changes.

### Moderating role of parents' personality characteristics

The moderating effects of Neuroticism, Extroversion, Conscientiousness, and Agreeableness on the relationship between problem behaviors and parenting stress were tested separately. The results showed that, before the pandemic, the moderating effects of Neuroticism ( $\beta = 0.005, p = 0.90$ ), Extroversion ( $\beta = 0.009, p = 0.85$ ), Conscientiousness ( $\beta = -0.04, p = 0.52$ ), and Agreeableness ( $\beta = 0.07, p = 0.15$ ) were not significant. During

the pandemic, the moderating effects of Extroversion ( $\beta = -0.02, p = 0.46$ ) and Conscientiousness ( $\beta = 0.02, p = 0.41$ ) were not significant; only Agreeableness ( $\beta = 0.07, p = 0.02$ ) and Neuroticism ( $\beta = -0.07, p = 0.05$ ) played a moderating role between children's problem behaviors and parenting stress.

### Moderating effect of agreeableness

Model 1 in the SPSS macro compiled by Hayes and Watson (2013) was applied to examine the moderating effect of Agreeableness on the relationship between problem behaviors and parenting stress during the pandemic. Table 4 shows these results. During the pandemic, children's problem behaviors positively predicted parenting stress ( $\beta = 0.57, p < 0.001$ ), and Agreeableness negatively predicted parenting stress ( $\beta = -0.21, p < 0.001$ ). The result suggest that, the more problem behaviors children have, the higher parents' parenting stress, and parents with higher levels of Agreeableness perceived less parenting stress. The interaction term of problem behaviors and Agreeableness significantly and positively predicted

**Table 4** Moderating effect of Agreeableness during pandemic

Regression equation		Fit			regression coefficient			
Outcome variable	Predictive variable	<i>R</i>	<i>R</i> <sup>2</sup>	<i>F</i>	$\beta$	BootCI low	BootCI up	<i>t</i>
Parenting stress	Parents' gender	0.62	0.39	54.30***	–0.09	–0.25	0.07	1.08
	Parents' age				0.00	0.00	0.03	1.96*
	Children's gender				–0.05	–0.15	0.12	0.15
	Children's age				0.01	–0.03	0.02	0.28
	Problem behaviors				0.57	0.51	0.64	17.25***
	Agreeableness				–0.21	–0.27	–0.14	6.29***
	Problem behaviors * Agreeableness				0.07	0.01	0.13	2.42*

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

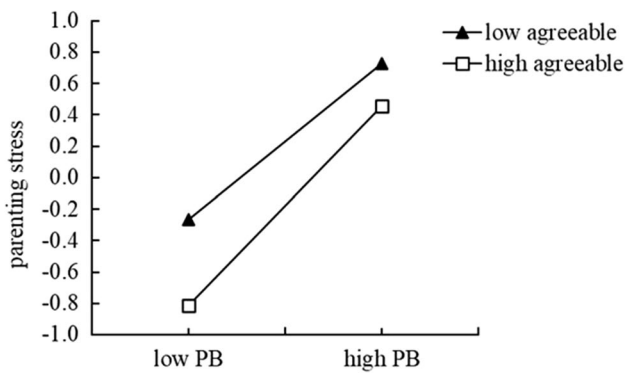


Fig. 1 Simple slope of the Agreeableness during the pandemic

parenting stress ( $\beta = 0.07, p = 0.02$ ), which partly proved Hypothesis 2 that parents' personality characteristics could moderate the relationship between children's problem behaviors and parenting stress.

A simple slope test investigated the difference of the effect at various levels of Agreeableness (Fig. 1) to reveal the moderating effect of Agreeableness on the relationship between problem behaviors and parenting stress. The results showed when the Agreeableness level was high ( $M + 1SD$ ), the predictive effect of problem behaviors on parenting stress was significant ( $\beta = 0.64, p < 0.001$ ). However, when the level of Agreeableness was low ( $M - 1SD$ ), the predictive effect became lower ( $\beta = 0.50, p < 0.001, \beta$  decreased from 0.64 to 0.50).

The same analyzation was used to examine the moderating effect of Agreeableness before the pandemic. The results showed that problem behaviors had a significant positive predictive effect on parenting stress ( $\beta = 0.59, p < 0.001$ ). Agreeableness had a significant negative predictive effect on parenting stress ( $\beta = -0.21, p < 0.001$ ). The interaction term of problem behaviors and Agreeableness had no significant predictive effect on parenting stress ( $\beta = 0.07, p = 0.15$ ). Before the pandemic, although Agreeableness could negatively predict parenting stress, it did not play a moderating role. This result, combined with the above

moderate effect analysis result in Sample 2, supported part of the Hypothesis 2 that the moderate role of parent's personality was different before and during the COVID-19.

**Moderating effect of Neuroticism**

First, Model 1 in the SPSS macro compiled by Hayes and Watson (2013) was applied to examine the moderating effect of Neuroticism during the pandemic. The results are shown in Table 5. During the pandemic, problem behaviors had a significant positive predictive effect on parenting stress ( $\beta = 0.52, p < 0.001$ ), indicating that the greater the extent of children's problem behaviors, the greater the stress felt by parents; Neuroticism had a significant positive predictive effect on parenting stress ( $\beta = 0.32, p < 0.001$ ), which implicates that parents with higher levels of Neuroticism perceived more parenting stress; the interaction item of problem behaviors and Neuroticism had a significant predictive effect on parenting stress ( $\beta = -0.07, p = 0.05$ ), pointed that parents' Neuroticism could moderate the relationship between children's problem behaviors and parenting stress during the pandemic.

A simple slope test was conducted to investigate the varying impacts at different levels of Neuroticism

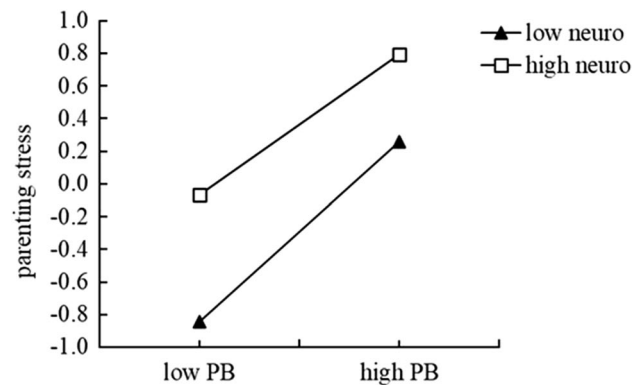


Fig. 2 Simple slope of the Neuroticism during the pandemic

**Table 5** Moderating effect of Neuroticism during pandemic

Regression equation		Fit			regression coefficient			
Outcome variable	Predictive variable	R	R <sup>2</sup>	F	$\beta$	BootCI low	BootCI up	t
Parenting stress	Parents' gender	0.67	0.45	68.25***	0.03	-0.12	0.18	0.41
	Parents' age				0.01	-0.00	0.02	1.61
	Children's gender				0.00	-0.12	0.13	0.06
	Children's age				0.00	-0.03	0.02	0.33
	Problem behaviors				0.50	0.44	0.57	15.00***
	Neuroticism				0.33	0.27	0.39	10.38***
	Problem behaviors * Neuroticism				-0.06	-0.12	-0.00	2.12*

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

(Fig. 2) to reveal its moderating effect on the relationship between problem behaviors and parenting stress. The results showed that when the Neuroticism level was high ( $M + 1SD$ ), the problem behaviors had a significant predictive effect on parenting stress ( $\beta = 0.43, p < 0.001$ ); when the Neuroticism was low ( $M - 1SD$ ), the predictive effect was enhanced ( $\beta = 0.55, p < 0.001$ , where  $\beta$  increased from 0.43 to 0.55).

Subsequently, the same analyzation was used to examine the moderating effect of Neuroticism before the pandemic. The results showed that problem behaviors before the pandemic had a significant negative predictive effect on parenting stress ( $\beta = 0.51, p < 0.001$ ); Neuroticism had a significant negative predictive effect on parenting stress ( $\beta = 0.39, p < 0.001$ ). The interaction term of problem behaviors and Neuroticism had no significant effect on the prediction of parenting stress ( $\beta = 0.01, p = 0.90$ ). Neuroticism could not moderate the relationship between children's problem behaviors and parenting stress before the pandemic; combined with the above results of Sample 2, the Hypothesis 2 was partly verified - the moderating role of parents' personality was different before and during COVID-19.

### Testing for differences between children with autism and intellectual disabilities

With the type of disorder as the independent variable and problem behavior, parental stress, Neuroticism, Extraversion, Agreeableness, and Conscientiousness as the dependent variables, an independent sample t-test was performed. The results showed that problem behaviors ( $t_{(1, 939)} = 1.79, p > 0.05$ ), parental stress ( $t_{(1, 939)} = 1.63, p > 0.05$ ), and Neuroticism ( $t_{(1, 939)} = 1.52, p > 0.05$ ) were not significantly different among children with autism and intellectual disabilities. Extraversion ( $t_{(1, 939)} = 3.05, p = 0.002$ ), Agreeableness ( $t_{(1, 939)} = 3.32, p = 0.001$ ), and Conscientiousness ( $t_{(1, 939)} = 3.62, p < 0.001$ ) were significantly different. Extraversion ( $Md = 0.09, 95\% CI: 0.03, 0.15$ ), Agreeableness ( $Md = 0.09, 95\% CI: 0.04, 0.15$ ), and Conscientiousness ( $Md = 0.12, 95\% CI: 0.06, 0.17$ ) of the children with intellectual disabilities were higher than those of children with autism. The study used group comparison to clarify whether there were differences in the moderating effect between children with autism and those with intellectual disabilities. After limiting the paths in the model of children with autism and intellectual disabilities to be equal, the Wald test was applied to evaluate the differences among direct paths and indirect effects. The results showed the differences were not significant (all  $p > 0.05$ ); parents' Agreeableness and Neuroticism have a robust moderating effect on the relationship between children's problem behaviors and parenting stress, both

among parents of children with autism and those of children with intellectual disabilities.

## Discussion

This study examined the relationships between problem behaviors of children with autism and intellectual disabilities and parenting stress in China before and during the COVID-19 pandemic. Furthermore, it investigated whether these were moderated by parents' personality traits. The results showed that problem behaviors positively predicted the stress of parents of children with autism and intellectual disabilities both before and after the pandemic outbreak. There was no difference in the prediction effects. The Agreeableness and Neuroticism of parents also moderated the relationship between children's problem behaviors and parenting stress. However, this effect only emerged after the COVID-19 outbreak. Neuroticism and Agreeableness could directly predict parenting stress before the outbreak. The results suggest that parental Agreeableness plays a protective role in the relationship between children's problem behaviors and parenting stress. Neuroticism, by contrast, is a risk factor in the specific environment of the COVID-19 pandemic.

### Relationship between problem behaviors of children with autism and intellectual disabilities and parenting stress

In previous studies of typically developing children (Baker et al., 2003; Krahé et al., 2015; Neece et al., 2012), problem behaviors in children positively predicted parenting stress. The present study obtained similar results for parents of children with autism and intellectual disabilities. Before and during the pandemic, stress among parents of children with autism and intellectual disabilities increased significantly with the level of children's problem behaviors. This finding aligns with the results of previous studies. The problem behavior of children with special needs is a strong predictor of an increase in parenting stress (Jijon & Leonard, 2020; Kwon et al., 2022; Osborne & Reed, 2009). Parents of children with autism and intellectual disabilities are exposed to more problem behaviors in childrearing (Davis & Neece, 2017; Neece et al., 2012), resulting in high levels of parenting stress. This situation can adversely affect their physical and mental health (Ren et al., 2020). Therefore, whether during the COVID-19 pandemic or in ordinary life, parents of children with autism and intellectual disabilities perceived parenting stress due to their children's problem behaviors. Support and methods for dealing with children's problem behaviors will help to relieve their parenting stress.



## Moderating effects of Agreeableness and Neuroticism

During the COVID-19 pandemic, Agreeableness and Neuroticism played a moderating role in the relationship between children's problem behaviors and parenting stress. When parents of children with autism and intellectual disabilities have higher levels of Agreeableness or lower levels of Neuroticism, the children's problem behaviors were associated with less parenting stress. The results support Abidin's parenting stress model (1992), suggesting that parents' personality characteristics could predict their parenting behavior. Previous studies have also shown that parents with high Neuroticism will experience more negative emotions and psychological pain under pandemic-related pressure (Mazza et al., 2020). Highly neurotic individuals are more likely to experience more intense stress during the pandemic (Liu et al., 2021a). By contrast, high Agreeableness was associated with more preventive behavior (Han et al., 2010). Researches during COVID-2019 also found that Agreeableness and Conscientiousness had positive correlation with preventive behavior (Han et al., 2021), hoard products (Yoshino et al., 2021) and negative correlation with fear, anxiety, and depression (Nikcevic et al., 2021). The current study results show that during the pandemic, the correlation between Agreeableness and Conscientiousness was much stronger than before the pandemic, which may indicate that the role of personality traits could be activated by specific events and regulated individual's responses. According to the current study's results, Agreeableness was a protective factor against stress in parents of children with autism and intellectual disabilities when facing the substantial adverse impacts of the sudden pandemic. By contrast, Neuroticism was a risk factor.

Parents' Agreeableness and Neuroticism play a moderating role in the relationship between children's problem behaviors and parenting stress. However, this moderating effect was only apparent after the outbreak of COVID-19. We suspect that, first, according to the congruence model of interactionism, the environment will enhance or weaken the influence of an individual's personality (Emmons et al., 1986). Agreeableness is characterized by cooperation, care, trust, and compassion. People high in Agreeableness more readily show positive attitudes when facing crises and have a better understanding of the increase of children's problem behavior, while accepting and dealing with the crisis positively. On the contrary, Neuroticism is more reactive with negative emotions (Hisler et al., 2020). Those with high Neuroticism are more likely to experience unpleasant feelings and higher levels of parenting stress in the face of pandemic situations and their children's problem behaviors.

Second, psychological stress is a state in which the social context threatens an individual's homeostasis. Personality characteristics play a role in psychologically stressful situations. Various personality traits influence individual differences in response (Wang & Yang, 2015). Therefore, in a stable environment before the COVID-19 outbreak, although personality characteristics predict parenting pressure, they do not moderate the relationship between children's problem behaviors and parenting stress. When the COVID-19 pandemic changed the environment, the moderating effect of personality characteristics manifested.

Finally, the Double ABCX Model of contemporary family stress theory (McCubbin & Patterson, 1983) emphasizes that family stress is a dynamic adjustment process. When stress levels change from a pre-pandemic equilibrium to a post-pandemic imbalance, families must create new patterns and strategies to maintain a balance. This ability depends on balancing the individual's resources and needs (Daneshpour, 2017). During the pandemic, parents require personal resources to cope with changes in work and life and also with the problem behaviors of their now isolated, home-bound children. Available personal resources directly influence their coping behavior. According to Vermaes et al. (2008), personal resources may offset the adverse effects of children's physical dysfunction. Parents with high Agreeableness may be able to mobilize more personal resources, while parents with Neuroticism may not. This study provides further evidence of the protective effects of parents' personal internal resources in caring for children with developmental disabilities.

The current results confirm that, regardless of the disorder types and pandemic factors, children's problem behavior was an important source of parenting stress, but this relationship is moderated by parents' personality only when the environment changes, such as under the COVID-19 pandemic. Taking the pandemic factors into consideration, special schools, special education institutions and special education teachers should pay more attention to behavior correction of children with autism and intellectual disabilities in the post-pandemic era. When helping parents relieve parenting stress and maintain mental health, those parents with certain personality traits should receive more supports.

## Limitations and future directions

When interpreting this study's findings, some limitations should be considered. First, our research participants mainly reside in Guangdong, China, limiting the representativeness of this sample. Second, the original pre-pandemic research did not anticipate the pandemic and conducted an anonymous survey. Therefore, the participant data collection did not allow for a rigorous matched control study or longitudinal research, and the result only represents group rather than

individual characteristics, which limits the generalizability of the results. Third, the current study found that Extroversion, Openness, and Conscientiousness of the Big Five Personality Traits had no significant moderating effect, which cannot be well explained. It is necessary to study these characteristics in the future and in more depth. Finally, the ongoing psychological changes in parents of children with autism and intellectual and other disabilities in the post-pandemic era should be investigated to further compare these with earlier results.

## Conclusion

This study aimed to explain the psychological mechanisms through which parents' personalities moderate the relationship between children's problem behaviors and parenting stress. The study results will help people provide more support to parents of children with autism and intellectual disabilities during the COVID-19 pandemic. Furthermore, parents' personality characteristics should be considered when helping them regulate their emotions and cope with their child's behavior. Our results also facilitate parents' utilization of the protective role of Agreeableness and avoidance of the adverse effects of Neuroticism. These strategies may alleviate the tremendous pressure parents face during the pandemic. In addition, this information can help parents of children with disabilities maintain their mental health and better deal with the pandemic.

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## Declarations

**Conflict of interest** On behalf of all authors, the corresponding author states that there is no conflict of interest.

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