

How are parental mental health and parenting practices associated with externalizing behaviors among young children with autism in China? A cross-sectional study and indirect effect analysis

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Abstract

Children with autism are more likely to exhibit externalizing behaviors than children without autism. A cross-sectional study was undertaken to investigate how parental mental health status and parenting practices contributed to the variance in externalizing behaviors among families of young children with autism in Chinese mainland, and whether parenting behaviors had any indirect effects on the relationship between parental mental health symptoms and externalizing behaviors. Data were drawn from the baseline assessment of a quasi-experimental study of a parent training program delivered to Chinese caregivers of children with autism aged 3 to 6 from diverse backgrounds ($N = 111$). Results showed that parental mental health symptoms and parenting behaviors explained the variance in child externalizing behaviors. Parental mental health problems and parental over-reactivity were linked to higher levels of child externalizing behaviors, whereas positive parenting was associated with less frequent externalizing behaviors. Positive parenting partially explained the relationship between parental mental health symptoms and externalizing behaviors. The findings of this study highlight the importance of actively attending to the psychological and parenting needs of caregivers in autism treatment programs. It points to the need for the development of culturally sensitive strategies to promote parental

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mental health and increase the use of positive parenting skills among parents of children with autism.

KEYWORDS

autism, externalizing behaviors, mental health, parenting

INTRODUCTION

Autism spectrum disorder is a neurodevelopmental disorder characterized by reciprocal social–communicative interaction and restricted and repetitive patterns of behaviors or interests (American Psychiatric Association, 2013). As with most low- and middle-income countries (LMICs), national data on childhood autism are yet to be established in China and regional estimates vary substantially. A study involving over 125,000 children between 6 and 12 years old found a local prevalence of 0.70%, comparable to the global estimate of 0.76% (Baxter et al., 2015; Zhou et al., 2020). However, China's very large population and potential underdiagnosing due to the scarcity of resources indicates that there may be a bigger than usual prevalence and impact in terms of autism.

Children with autism experience higher rates of behavioral problems than children without autism and those diagnosed with other types of developmental disabilities (Totsika et al., 2011). A systematic review of evidence mainly from high-income countries shows that approximately one quarter of children with autism are comorbid with oppositional defiant disorder or conduct disorder (Kaat & Lecavalier, 2013). The co-occurrence with other disability-related challenges of this nature can compound autism conditions, interfering with skill acquisition and leading to further limitations in daily activities and child development. Autism has historically been linked to more parental mental health problems (Griffith et al., 2010; Totsika et al., 2011). Research in Chinese populations has also indicated heightened levels of parental stress and depressive symptoms in caregivers of children with autism (Chan & Lam, 2018; Huang et al., 2014).

The transactional model (Sameroff, 2009) proposes that a child's development is shaped by continuous, dynamic interactions between various factors at the child, parent, and family levels. Based on this model, parental mental health problems can influence parenting practices, which, in turn, may affect child behavior. On the other hand, the parental acceptance–rejection theory (PARTheory, Rohner, 1975) suggests that a child's mental health and well-being are influenced by the degree to which they feel accepted or rejected by their parents. This theory explains that parental acceptance or rejection is conveyed to children through various parenting behaviors. For example, parental acceptance is shown through parental warmth and affection, such as physical intimacy and verbal compliments. In contrast, parental rejection can be communicated through negative parenting practices, including physical and verbal aggression, and neglect (Rohner et al., 2012). Furthermore, the PARTheory postulates that children who experience rejection from their parents are at a higher risk of behavioral maladjustment (Rohner & Britner, 2002). As per this theory, parental mental health problems can hamper their ability to offer emotional support and acceptance to their children, which may contribute to child behavioral problems.

Longitudinal studies have yielded inconsistent findings of the relationships between parental mental health problems and child behavioral problems. While some studies have found a bidirectional reciprocal relationship between parental mental health and child behaviors (Lecavalier et al., 2006; Rodriguez et al., 2019), others suggest that the relationship is more likely to be unidirectional, with general parental stress predicting child disruptive behaviors (Lin et al., 2021; Zaidman-Zait et al., 2014) or vice versa (Stewart et al., 2020). Nonetheless, there is

also evidence suggesting that child behavioral problems and parental mental health may not lead to an exacerbation of one another (Peters-Scheffer et al., 2012).

Parenting practices have been shown to be strongly associated with child behavioral problems. Three systematic reviews of parenting programs for the general population in high-income countries and regions have confirmed that the use of positive parenting practices contributed to the improvement of child behavioral adjustment (Kaminski et al., 2008; Leijten et al., 2018, 2019). Observational evidence has also found that negative parenting practices were linked with more disruptive behaviors in children with autism in the United States (Clauser et al., 2021), as well as children without autism in China (Liu & Guo, 2010).

Several studies have indicated that parenting practices may mediate the relationship between parental psychological functioning and child behavioral problems among families of children without autism in Italy (Bellina et al., 2020), Finland (Aunola et al., 2013), and the United States (Grasso et al., 2016). There is also emerging evidence on such mediating effects among British and U.S. families of children with autism (Osborne et al., 2008; Shawler & Sullivan, 2017). Nonetheless, existing evidence chiefly comes from high-income countries and has limited global representation.

Despite a growing body of evidence, children with autism residing in LMICs where families have limited access to support are much less well represented in research than children from high-income countries and regions. Raising a child with autism can be stressful irrespective of geographical location, but accumulated adversities, such as poverty, the severe lack of autism-related information and resources, and negative cultural attitudes toward disabilities in some cultures, may contribute to an increased risk of parental psychological distress and child behavior problems for families with children with autism in LMICs (Clark et al., 2019; Huang & Zhou, 2016). How different cultures define “appropriate” parenting behaviors might also influence the extent to which parenting practices affect child disruptive behaviors (Simons et al., 2002). However, there is still very limited research on (the associations between) parental mental health, parenting practices, and child behaviors related to autism in LMIC cultures and contexts. Such research is important because existing studies have indicated cross-cultural differences in autism symptoms and associated impacts (Harrison et al., 2017), and up-to-date research with regard to family experiences in LMICs could contribute recognition about the need for further research on this topic.

This study addresses the research gap by answering the following questions: (a) whether parental mental health symptoms and parenting practices contribute to the variance in externalizing behaviors among young children with autism aged 3 to 6 from Chinese mainland, and (b) whether parenting practices explain the relationship between parental mental health and child externalizing behaviors in Chinese settings. Findings of this study may be used to inform the development of culturally sensitive strategies to support autism populations in other LMICs, which share similar cultural contexts and that have a severe lack of resources for families of children with autism.

METHODS

Design and participants

This study used a cross-sectional design drawing data from the baseline assessment of a mixed methods evaluation of a parent training program delivered in a routine service setting for caregivers of young children with autism in Beijing, China (ClinicalTrials.gov CT04257331, Fang, Lachman, Qiao, & Barlow, 2022; Fang, Lachman, Zhang, et al., 2022). The evaluation took place in a suburban area of Beijing. Data were collected between August and September 2020. To be eligible for the study, participants must have met the following criteria: (a) caregivers

of children between 3 and 6 years diagnosed with or meeting the *DSM-V* diagnostic criteria for autism, (b) primary caregivers undertaking the responsibility for the daily childcare for at least five days a week, and (c) provided verbal informed consent to the program evaluation. Although the intervention was conducted in Beijing, recruitment was not limited to families residing in the city, but was open to families from all administrative divisions of China. Only one caregiver–child dyad was recruited from each family. No limitation was imposed on the severity of diagnosis or level of child abilities. The implementing organization invited caregivers who were on a permanent program waiting list and signed up for the delivery between September 2020 and January 2021 to participate. Interested families received information sheets from research staff and could contact the team for project details or address concerns before giving consent. Participation was voluntary, and data collection occurred only from caregivers who provided formal consent. This resulted in a final sample size of 111 dyads. Ethical approval was granted by the University of Oxford (R67619/RE001) and the Beijing Normal University (SSDPP-HSC2020001). The STROBE cross-sectional guidelines were used for reporting of the results (von Elm et al., 2007).

In addition to recruiting participants using their existing resources, the organization that delivers the parent training program also took part in the planning of the overall research project. They contributed to the development of the research design and research questions. The organization did not participate in data collection or analysis but was actively involved in the interpretation of results and led in disseminating the research findings to a wider autism community in China.

Measures

Child externalizing behavior was measured using the *externalizing* scale of Child Behavior Checklist (CBCL) 1.5–5 (Achenbach & Rescorla, 2001; Pannucci & Wilkins, 2010). It contains two subscales: *attention problems* and *aggressive behaviors*. The *attention problems* subscale consists of five items (e.g., “cannot concentrate,” “quickly shifts,” and “wanders away”) and the *aggressive behaviors* subscale has 19 items (e.g., “can't stand waiting” and “demands met”). Parents rated child performance during the previous 2 months with a 3-point Likert-type scale (0 = *not true*, 2 = *very true or often true*). Items were summed up to create a total externalizing behavior intensity score, with lower scores suggesting fewer problems. The CBCL 1.5–5 has shown excellent internal consistency ($\alpha=0.80\text{--}0.93$) and factorial validity (CFI=0.97) in children with autism (Pandolfi et al., 2009), as well as good test–retest reliability, internal consistency, and cross-cultural validity in Chinese population (Leung et al., 2006; Liu et al., 2003; Tan et al., 2007). Previous research also showed similar levels of internal consistency of the CBCL 1.5–5 in children with autism aged 5 and 6 (Basten et al., 2014). The Cronbach's alpha coefficient for the scale was 0.83 in this study, indicating high internal consistency.

Parental mental health was investigated via assessing the extent of depressive, anxiety, and stress symptoms, using the Chinese version of the Depression Anxiety Stress Scale-21 items (DASS-21) (Lovibond & Lovibond, 1995). The DASS-21 comprises three self-report subscales with each having seven items, which are rated from 0 (not apply to me) to 3 (apply to me very much or most of the time) based on performance over the past week. The three subscales include (1) *depression* (e.g., “I felt that I had nothing to look forward to” and “I found it difficult to work up the initiative to do things”), (2) *anxiety* (e.g., “I was aware of dryness of my mouth” and “I experienced trembling”), and (3) *stress* (e.g., “I tended to over-react to situations” and “I found it difficult to relax”). Scores were summed and multiplied by 2 to create a final score, with lower scores indicating fewer depressive, anxiety, and stress symptoms. The Chinese version has shown good internal consistency ($\alpha=0.89\text{--}0.95$), test–retest reliability (test–retest Pearson's correlation coefficient = 0.75), and convergent validity (Wang et al., 2016;

Wen et al., 2012). The scale demonstrated high internal consistency in our study, with a Cronbach's alpha of 0.92.

Harsh parenting practices were measured using the *overreactivity* subscale of the Arnold-O'Leary Parenting Scale (PS) (Arnold et al., 1993), designed for caregivers of children aged 2 to 16. It consists of five statements (e.g., "when I'm upset or under stress, I am picky and on my child's back, or I am no more picky than usual"). Caregivers rated each statement on a 7-point Likert-type scale, selecting the number that best describes their parenting styles during the previous month. A total score was calculated by summing the item scores and dividing it by 5, with higher scores indicating more dysfunctional parenting practices. The PS *overreactivity* subscale has demonstrated adequate internal consistency ($\alpha=0.79-0.82$) and test-retest reliability (ICC=0.82), as well as a significant correlation with the CBCL (Arnold et al., 1993; Leung et al., 2003). Cronbach's alpha for the subscale was 0.74 in this study, indicating good internal consistency.

Positive parenting behaviors were measured using the *supporting positive behavior* subscale of the Parenting Young Children Scale (PARYC) (McEachern et al., 2012). This subscale consists of seven items (e.g., "play with your child in a way that was fun for both of you?"). Caregivers are asked to rate each question from 1 (not at all) to 7 (most of the time) according to the frequency with which they are engaged in such parenting strategies during the previous month. Items were summed to create a total score ranging from 0 to 49 with higher scores representing more positive parenting practices. The scale has demonstrated sufficient construct and convergent validity and good internal consistency ($\alpha=0.78$) in the United States (McEachern et al., 2012). It showed a Cronbach's alpha of 0.67 in this study.

The Autism Treatment Evaluation Checklist (ATEC) (Rimland & Edelson, 1999) was routinely administered by program staff for the purpose of monitoring and evaluation. It comprises four subscales – *speech/language/communication*, *sociability*, *sensory/cognitive awareness*, and *health/physical/behavior* – and has 77 items scored by parents recalling child performance during the previous month. Total score ranges from 0 to 179, with lower scores indicating fewer autism symptoms. Research has demonstrated adequate internal consistency ($\alpha=0.75-0.79$) of the Chinese version of ATEC (Fang et al., 2019; Sunakarach & Kessomboon, 2018). However, the ATEC is designed to detect treatment benefits, rather than rate autism severity. This study decided not to administer other standardized measures for autism symptoms, to reduce participant burden and improve overall data quality. ATEC scores were reported as participant characteristics and not included in statistical analyses. The Cronbach's alpha for the scale was 0.95 in this study.

Data collection and analysis

All questionnaires were converted into an online survey system that encrypted each survey when it was submitted. Given the different literacy levels among participants, the questionnaires were administered by trained data collectors reading out the questions to the caregivers and entering answers into the online system. All data collectors were trained on a range of topics including research ethics, informed consent, research protocols, working with vulnerable families, child protection protocol, safety protocol, and interview techniques.

No missing values were identified for the variables of interest. Pearson's correlation analyses were conducted to examine the relationships between child externalizing behaviors, parenting practices, and parental mental health symptoms. Hierarchical regression models were built to investigate the extent to which parenting practices and parental mental health symptoms explained a statistically significant amount of variance in child externalizing behaviors. Based on power analysis, the regression models could include a maximum of 10 variables at a significance level of 0.05 and a statistical power of 0.80 with a total sample size of 111 dyads. A null model was first

created by regressing child externalizing behaviors on an intercept with no independent variable to calculate the total sum of squares. Sequential models were built by adding child characteristics (child age and gender), parental mental health symptoms, and parenting practices at each step. Differences in sum of squares and changes in R^2 s were computed. The selection of child age and gender was theory driven, based on existing research demonstrating the variability of behavioral problems in male and female children with autism (Tillmann et al., 2018; Wang et al., 2017) and the potential association between disruptive behaviors and child age (Skwerer et al., 2019).

Process models were built using a nonparametric bootstrapping approach to investigate potential impact of positive parenting and parental overreactivity on the association between parental mental health symptoms and externalizing behaviors. Due to the small sample size and limited statistical power, we created two models to test the two parenting variables separately rather than including them in one model simultaneously to investigate their joint effect. The 95% confidence intervals (CIs) were produced based on 1000 bootstrap samples to determine the significance of average causal mediation effect (ACME; i.e., indirect effect of parenting practice on externalizing behaviors through parental mental health symptoms), average direct effect (ADE; i.e., direct effect of parenting practice on externalizing behaviors after removing the contribution of parental mental health symptoms), and total effect of parenting practice on externalizing behaviors (Preacher & Hayes, 2004). All analyses controlled for child age and gender. In addition, structural equation modeling was employed to further validate the findings.

Analyses used raw scores rather than converting them into standard scores to better reflect the variability (Keefer et al., 2020). Regression assumptions were checked (Fox & Sanford, 2018). Participating families were from different regions of China and not known to each other at the time of assessment, thus not violating the independence assumption. Normality was tested by plotting the residuals against the best fit normal distribution. The curves were close to each other in each model, indicating adequate normality. Linearity was diagnosed using component-plus-residual plots, with slight nonlinearity detected for parental mental health symptoms and parental overreactivity. The problem was solved by adding a quadratic term for each variable. A visual examination of homoscedasticity using fitted versus residual and residual versus predictor plots, showed no evidence of nonconstant variance. No outliers were identified after plotting Studentized residuals with fitted values and testing extremely large residuals with adding Bonferroni adjustment. All statistical analyses were conducted using R v4.3.0.

RESULTS

Demographic characteristics of the participants are presented in Table 1. The ATEC total scores of participating children ranged from 16 to 118 ($M=67.13$, $SD=21.29$). The subscale scores also varied substantially – speech/language/communication, ranging from 0 to 26 ($M=15.67$, $SD=6.49$); sociability, 3 to 32 ($M=15.99$, $SD=6.17$); sensory/cognitive awareness, 5 to 31 ($M=18.69$, $SD=5.79$); health/physical/behavior, 2 to 41 ($M=16.77$, $SD=8.15$) – indicating the involvement of families with diverse levels of autism-related challenges.

Over 80% of the children were male, which is consistent with the estimate that autism is 4.3 times more prevalent among boys than girls (Maenner et al., 2020). The mean child age was 4.7 ($SD=1.12$). Of the sample, 7.21% were ethnic minorities, comparable to the overall proportion (8%) of ethnic minorities in China (National Bureau of Statistics of China, 2011). Participating caregivers were predominantly female (92.79%) with a mean age of 34.75 (5.8). Around 60% were full-time caregivers and attended high school or less. About one third (28.83%) had an annual income below the national average salary. Of the families, 50.45% had more than one child and 42.34% were classified as a rural resident.

TABLE 1 Demographic characteristics.

Demographic characteristics	N (%)
Child gender, female	18 (16.22)
Child age, mean (<i>SD</i>)	4.70 (1.12)
ATEC, total score	67.13 (21.29); range: 16–118
ATEC, speech/language/communication	15.67 (6.49); range: 0–26
ATEC, sociability	15.99 (6.17); range: 3–32
ATEC, sensory/cognitive awareness	18.69 (5.79); range: 5–31
ATEC, health/physical/behavior	16.77 (8.15); range: 2–41
Ethnicity, minorities	8 (7.21)
Adult gender, female	103 (92.79)
Adult age, mean (<i>SD</i>)	34.75 (5.80)
Adult education, high school or less	65 (58.56)
Annual income, below the national average salary	32 (28.83)
Work status, unemployed	70 (63.06)
Spouse work status, unemployed	10 (9.01)
Household registration/hukou, rural	47 (42.34)
Number of children, two or more	56 (50.45)

Abbreviation: ATEC, Autism Treatment Evaluation Checklist.

Child externalizing behaviors had a mean score of 20.65 ($SD=7.19$), with 19 children within the borderline range and eight in the clinical concern range (Table 2). An average score of 35.3 (22.56) was obtained for parental mental health symptoms. Parental overreactivity was rated 3.53 (1.18) on average, and positive parenting was 34.2 (5.88) on average. Pearson's correlation analyses indicated that these variables were significantly correlated with each other. The strength of the correlation with parenting practices and child externalizing behaviors was similar across the DASS-21 subscales (depressive, anxiety, and stress symptoms).

The results of hierarchical regressions are shown in Table 3. The total sum of square (SS) was 5689. Parental mental health symptoms accounted for an additional 807 SS and the R^2 (0.146) increased by 0.14. The change was statistically significant ($F[2, 106]=9.58, p=0.000$), suggesting that parental mental health problems contributed to the variance in child externalizing behaviors. The regression further indicated that parental mental health symptoms were positively linked with child externalizing behaviors ($b=0.22, 95\% \text{ CI } [0.04, 0.39], p=0.018$). Adding parenting practices into the model resulted in an additional 518 SS and the R^2 (0.237) increased by 0.09. The result was statistically significant ($F[3, 103]=4.10, p=0.009$), indicating that harsh and positive parenting also led to the variance in child externalizing behaviors. Regression analysis found that positive parenting was related to fewer externalizing behaviors ($b=-0.25, 95\% \text{ CI } [-0.49, -0.02], p=0.038$), whereas harsh parenting was linked to more frequent child externalizing behaviors ($b=5.92, 95\% \text{ CI } [1.21, 10.63], p=0.015$). The association between parental mental health symptoms and externalizing behaviors was no longer maintained after accounting for parenting practices ($b=0.17, 95\% \text{ CI } [-0.01, 0.34], p=0.059$).

Indirect effect analyses showed that positive parenting partially explained the relationship between parental mental health symptoms and child externalizing behaviors (ACME = 0.03, 95% CI [0.01, 0.06], $p=0.014$; ADE = 0.09, 95% CI [0.03, 0.15], $p=0.002$; total effect = 0.12, 95% CI [0.07, 0.17], $p=0.000$), whereas parental overreactivity had no indirect effect (ACME = 0.02, 95% CI [-0.004, 0.04], $p=0.156$; ADE = 0.10, 95% CI [0.04, 0.16], $p=0.002$; total effect = 0.12, 95% CI [0.06, 0.17], $p=0.000$) (Table 4). Similarly, the robustness checks revealed no indirect effects of parental overreactivity but identified some indirect

TABLE 2 Descriptive statistics and Pearson's correlations for the variables of interest.

Variable	<i>N</i>	<i>M</i> (<i>SD</i>)	1	2	3	4	5	6	7
1. Child externalizing behaviors	111	20.65 (7.19)	–						
2. Parental mental health symptoms	111	35.3 (22.56)	0.36**	–					
3. Depressive symptoms	111	10.5 (8.89)	0.27**	0.9**	–				
4. Anxiety symptoms	111	8.69 (7.30)	0.37**	0.89**	0.70**	–			
5. Stress symptoms	111	16.11 (8.68)	0.36**	0.92**	0.74**	0.76**	–		
6. Overreactive parenting	111	3.53 (1.18)	0.25*	0.34*	0.29**	0.24	0.39**	–	
7. Positive parenting	111	34.2 (5.88)	–0.33**	–0.42**	–0.41**	–0.39**	–0.34**	–0.29*	–

* $p < 0.05$; ** $p < 0.01$.

TABLE 3 Hierarchical regression models predicting child externalizing behaviors.

Variables	Model 1	Model 2	Model 3
Child gender	–0.98 (–4.64, 2.68)	–0.21 (–3.66, 3.23)	0.07 (–3.27, 3.41)
Child age	0.28 (–0.93, 1.50)	0.40 (–0.74, 1.54)	0.55 (–0.56, 1.65)
Parental mental health symptoms		0.22* (0.04, 0.39) $p = 0.018$	0.17 (–0.01, 0.34)
Positive parenting			–0.25* (–0.49, –0.02) $p = 0.038$
Parental overreactivity			5.92* (1.21, 10.63) $p = 0.015$
Constant	20.13* (13.61, 26.65)	13.20*** (6.00, 20.40)	11.12 (–2.97, 25.20)
Observations	111	111	111
R^2	0.004	0.146	0.237
Adjusted R^2	–0.014	0.114	0.185
F statistic	0.235 (df = 2; 108)	4.539** (df = 4; 106)	4.577*** (df = 7; 103)
F (R change)	\	9.581***	4.098**

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

effects of positive parenting. More specifically, the results indicated that with every 0.11 unit increase in the association between parental mental health symptoms and positive parenting practices, child externalizing problems increased by 0.03 units, with a bias-corrected bootstrapped 95% CI of [0.01, 0.06].

DISCUSSION

This study examined the relationships between two parental characteristics – parental mental health symptoms and parenting practices – and externalizing behaviors among children with autism aged 3 to 6 in Chinese mainland. The hierarchical regression models indicated that parental mental health symptoms explained the variance in child externalizing behaviors and that more parental mental health problems were associated with more child disruptive behaviors. This finding is consistent with the concurrent association identified by cross-sectional studies in Taiwan (Hou et al., 2018; Huang et al., 2014). The transactional intervention model suggests that stressors related to a child's autism diagnosis are linked to difficulties in a number of

TABLE 4 Indirect effects of parenting practices on the association between parental mental health symptoms and externalizing behaviors.

	Estimate	95% Confidence interval	<i>p</i>
Positive parenting			
Average causal mediation effect	0.03	[0.01, 0.06]	0.014*
Average direct effect	0.09	[0.03, 0.15]	0.002**
Total effect	0.12	[0.07, 0.17]	0.000***
Proportion mediated	0.25	[0.05, 0.60]	0.014*
Harsh parenting			
Average causal mediation effect	0.02	[-0.004, 0.04]	0.156
Average direct effect	0.10	[0.04, 0.16]	0.002**
Total effect	0.12	[0.06, 0.17]	0.000***
Proportion mediated	0.13	[-0.03, 0.41]	0.156

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

child, parent, and family domains, and these domains can reciprocally affect the development of children with autism (Karst & van Hecke, 2012). Congruent with this theory, a recent qualitative study involving practitioners who subsequently delivered the parent training program to participants in the original quasi-experiment, also showed that improving parental mental health was universally perceived as having multidimensional benefits – practitioners described the way in which the improvements in parental emotional well-being would be conducive to a better family environment, which would in turn promote a range of child and parental outcomes (Fang, Lachman, Zhang, et al., 2022). However, we were not able to formally investigate the causal relationships due to the current unavailability of follow-up data.

Our results suggest that both positive parenting practices and parental overreactivity were associated with child externalizing behaviors and that parenting practices significantly contributed to the heterogeneity of child externalizing behaviors, which is consistent with existing research showing that parenting styles can affect externalizing behaviors in children with autism (Clauser et al., 2021), as well as in the general population (Kaminski et al., 2008; Leijten et al., 2018, 2019). Research suggests that the degree to which negative parenting practices relate to child behavioral problems may vary across contexts: for example, harsh parenting is less likely to increase disruptive behaviors in cultures where such parenting practices are commonly accepted (Simons et al., 2002). A survey involving 2689 urban parents in Chinese also found that harsh parenting was perceived by parents to be an effective and legitimate parenting practice that promotes diligence, integrity, and obedience (Wang & Liu, 2014). Another study in Beijing showed that corporal punishment was perceived by parents as representing a sign of parental affection (Qiao & Xie, 2015). Despite these traditional beliefs, we found a strong association between harsh parenting and more frequent externalizing behaviors in children with autism, which suggests a universal negative impact of harsh discipline on children with autism across cultures. However, it should also be noted that some research indicates that Chinese parents do not use more corporal punishment than parents in other culturally similar or distinct countries, such as the Philippines and Italy (Lansford et al., 2014; Riem et al., 2021). This suggests that the negative impact of harsh discipline on children with autism in China might be explained by factors beyond the cultural acceptance of such practices.

Our indirect effect analyses provide more insights into the relationship between parental mental health symptoms and externalizing behaviors. The indirect effect of parenting is in line with research involving children with developmental disabilities and delays, which shows parenting behaviors to be a mediator between parental distress and child externalizing behaviors

(Sanner & Neece, 2018). Our findings further indicate that the pathway from parental mental health symptoms to externalizing behaviors is more likely to be influenced by supportive parenting than parental overreactivity. This is consistent with previous research, which shows a stronger impact of teaching parents positive parenting practices than reducing harsh discipline in terms of changing child behaviors (Gardner et al., 2010), thereby highlighting the importance of promoting positive parenting skills among families living with autism.

This study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships, and the small sample size was determined by the service capacity of the implementing organization. While efforts were made to enhance statistical power by reducing sample variance, caution should be exercised in interpreting the results. Additionally, the use of short scales for parenting practices may have limited sensitivity in detecting participant variance. The reliance on parent-reported data, administered verbally by research staff, may also introduce bias and social desirability.

The sample comprised participants from various backgrounds resulting in a heterogeneous population. For instance, there was a mixture of families across different economic status, with 28.83% living in poverty. Participants were roughly divided into equal halves in terms of several demographic characteristics (e.g., residency, education, and number of children). The diversity of participants substantially contributed to the external validity of findings. Nonetheless, the generalizability was still limited in multiple aspects. First, participating children were between 3 and 6 years, which reduced sample heterogeneity, but indicate that the results may not be applicable to other age ranges. Second, the study involved only seven male caregivers, which may be due to participant employment status: two thirds of the female participants were full-time caregivers, whereas 90% of their spouses were employed. This is in line with previous surveys, indicating that primary caregivers of children with autism in China were predominantly mothers (Guo et al., 2014). However, Chinese fathers are not absent in providing childcare for children with disabilities (Qian et al., 2015). Therefore, it could have been beneficial to include more male caregivers using targeted recruitment and sampling strategies. Third, the data collection was conducted during the pandemic. COVID-19 disrupted the lives of the families in general, creating additional sources of stress (Cluver et al., 2020), which might have exacerbated caregiver mental health problems and altered parenting practices.

There is a need for more studies investigating other parental (e.g., parental self-efficacy and competence) and familial (e.g., family function) factors that interact with autism, as well as their implications. Longitudinal studies are needed to identify causal relationships between child externalizing behaviors and associated factors. Future studies should also use more sensitive scales and observational measures to assess parental practices and increase the statistical power of the analysis. More male caregivers should be involved in future research, given their integral role in child development (Pancsofar & Vernon-Feagans, 2006), and exploration as to whether improvement of paternal mental health status and parenting behaviors also reduces the risk of family conflict and social isolation for mothers. More data should be gathered outside high-income countries or “Western” cultures to better represent the distinctive needs of families affected by autism across the globe and facilitate the creation of culturally appropriate treatments.

The Lancet Commission on Autism shows that family is the primary source of support for preschool-age children with autism (Lord et al., 2022). The findings of this study suggest that behavioral treatments for children with autism should actively address caregivers' psychological needs in addition to focusing on the needs of individual children, especially in LMICs where there are substantial barriers to child and adult care. Greater institutional resources are needed to support the implementation of caregiver services – such as scale-up of evidence-based parenting interventions and peer support groups – to reduce parental stress and increase positive parenting practices. Such programs may also create social support systems and increase child opportunities to learn. Interventions in LMICs may benefit from the inclusion of

caregivers in the development and delivery of services to better address their complex needs. They may also benefit from institutional efforts to reduce stigma and discrimination and improve public knowledge of autism, so that there can be a more inclusive and supportive environment for families of children with autism.

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DATA AVAILABILITY STATEMENT

The anonymized individual participant data, analytic code, unpublished full study protocol, and other research materials will be available upon request.

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