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Comparative effects of mindfulness-based stress reduction and psychoeducational support on parenting stress in families of autistic preschoolers

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Abstract

Relative to parents of children with neurotypical development and other developmental disabilities, parents of autistic children experience higher levels of parenting stress, which are associated with deleterious consequences for parents' mental and physical health and child functioning. Despite urgent calls to action, parenting stress is rarely addressed directly in interventions for families of autistic children, and less so in underserved and racial/ethnic minority populations where clinical needs are greater. This study tested the efficacy of mindfulness-based stress reduction, compared to a psychoeducation and support intervention, in reducing parenting stress among diverse families of autistic preschoolers. Participants ($N = 117$) were randomly assigned to the mindfulness-based stress reduction or psychoeducation and support groups; assessments were conducted at baseline, immediately postintervention, and 6 and 12 months postintervention. Results indicated significant reductions in parenting stress across both the mindfulness-based stress reduction and psychoeducation and support intervention conditions; however, reductions in parenting stress were greater for parents in mindfulness-based stress reduction than in psychoeducation and support. Furthermore, the benefit of mindfulness-based stress reduction relative to psychoeducation and support increased over time, with significant group differences in parenting stress detected at 12-month follow-up.

Lay abstract

Parents of autistic children often experience high levels of parenting stress, which can have negative mental and physical effects on both the parent and child. This study tested the efficacy of mindfulness-based stress reduction in reducing parenting stress in parents of preschool-aged autistic children compared to a psychoeducation and support intervention. We assessed parenting stress before and after the interventions and at 6- and 12-month follow-up. Both interventions significantly decreased parenting stress, but mindfulness-based stress reduction reduced stress more than did psychoeducation and support, with the strongest effect observed 1 year later. This suggests that the stress-reducing benefits of mindfulness-based stress reduction persist and may increase over time.

Keywords

autism spectrum disorder, mindfulness, parenting stress, preschoolers

Parents of autistic children report higher levels of stress on average relative to parents of children with neurotypical development, genetic disorders, chronic illnesses, and other intellectual and developmental disabilities (IDD; Baker-Ericzén et al., 2005; Barroso et al., 2018; Dabrowska & Pisula, 2010; Estes et al., 2009; for a review, see Hayes & Watson, 2013). Approximately one-third of parents of autistic children report clinically elevated stress levels, suggesting a high need for intervention (Davis & Carter, 2008). Despite urgent calls to action (Bearss et al., 2015; Oono et al., 2013), parenting stress has rarely been addressed directly in interventions for families of autistic children, and even less so in underserved and racial/ethnic

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minority populations where clinical needs are greater (Magaña et al., 2012). Recent investigations have drawn upon approaches such as mindfulness-based stress reduction (MBSR; Kabat-Zinn, 2013) to address parental well-being in families of children with unspecified or heterogeneous diagnoses (e.g. Neece, 2014). Although early efforts are promising, a more rigorous evaluation of MBSR involving active comparison conditions, longitudinal assessment, and inclusion of diverse well-characterized samples is needed. Moreover, the efficacy of MBSR has not been rigorously tested among families of autistic children.

Parenting stress is common in families of autistic children, and may be tied to a variety of factors, including children's core symptoms and co-occurring conditions, parents' own mental health and related processes, as well as external stressors (e.g. Benson, 2006; Karst & Van Hecke, 2012). High levels of parenting stress have been associated with deleterious consequences for parents' mental, physical, and relational health as well as parenting behaviors, intervention uptake, and broader family well-being in families of autistic children (Allik et al., 2006; Osborne et al., 2008; Rao & Beidel, 2009). Parenting stress also predicts subsequent child externalizing behavior problems, with longitudinal studies suggesting a mutually escalating transactional relationship in which parenting stress and child behavior problems exacerbate one another over time (Lecavalier et al., 2006; Osborne & Reed, 2009). Although findings remain mixed regarding the directionality of effects, several studies suggest the potential for parent-driven processes in early development wherein parenting stress predicts future child behavior problems more strongly than child behavior problems predict parenting stress in families of autistic children, indicating that parenting stress represents a primary predictor of child and family functioning in this population and an important target for early intervention (Lin et al., 2021; Osborne & Reed, 2009; Zaidman-Zait et al., 2014).

Parents of preschool-aged (i.e. 3- to 5-year-old) autistic children may face unique risks for clinically elevated parenting stress. During this period in which developmental difficulties are often first recognized and early identification of ASD takes place (De Giacomo & Fombonne, 1998), parents may experience numerous stressors related to the timely acquisition of diagnostic and intervention services (Shattuck et al., 2009), including personal and emotional adjustments (e.g. reactions to diagnosis, recalibrating expectations and parenting; Wachtel & Carter, 2008), as well as a host of practical, logistical, financial, and related challenges (e.g. Grindle et al., 2009). Parents from underserved and racial/ethnic minority backgrounds face additional barriers to accessing and utilizing quality diagnostic and treatment services that may further compound parental strain (Rivera-Figueroa et al., 2022; Smith et al., 2020). Interventions that focus on reducing parenting stress in these diverse, high-need populations are crucial.

To date, parent support groups remain one of the most commonly used interventions for parents of autistic children, as they are relatively cost-effective and easily implemented (Clifford & Minnes, 2013). However, strong evaluation data are lacking and few studies have examined the effects of support groups on parenting stress (for a review, see Rutherford et al., 2019). Other studies have used cognitive behavioral techniques to reduce stress in parents of autistic children and those with IDD. Although findings are promising, these studies have predominantly used no-treatment, treatment-as-usual, or waitlist-control comparisons, which often do not account for nonspecific effects of provider contact (e.g. Gammon & Rose, 1991; Izadi-Mazidi et al., 2015; Mueller & Moskowitz, 2020 for reviews, see Da Paz & Wallander, 2017; Hastings & Beck, 2004). In addition, several investigations have examined whether parent-mediated interventions, wherein the parent serves as the principal change agent for the autistic child, can alter parent outcomes as well. Unfortunately, effects on parents, including parenting stress, appear inconsistent across studies (see Kulasinghe et al., 2023; Oono et al., 2013 for reviews). Moreover, emerging evidence suggests that parenting stress may attenuate the efficacy of behavioral interventions for autistic children (Osborne et al., 2008), highlighting the importance of addressing parenting stress directly to sustain intervention gains.

Recently, parent stress-reduction interventions have drawn on mindfulness-based approaches to improve parental well-being in families of autistic children (for reviews, see Cachia et al., 2016; Ferraioli & Harris, 2013; Hartley et al., 2019). Given the severity and chronicity of daily stressors experienced by these families, mindfulness-based interventions, which focus on managing rather than eliminating stress, may be particularly valuable. Research in this area has largely examined the utility of mindfulness-hybrids using quasi-experimental designs (e.g. de Bruin et al., 2015; Hwang et al., 2015; Jones et al., 2018; Lunsky et al., 2021; Rayan & Ahmad, 2016; Ridderinkhof et al., 2018; Ruiz-Robledillo et al., 2015; Schwartzman et al., 2021), although some randomized trials have been conducted (Ferraioli & Harris, 2013; Lunsky et al., 2017). For example, mindfulness-based cognitive therapy (MBCT; Segal et al., 2002) has been found to enhance quality of life and positive stress reappraisal (Rayan & Ahmad, 2016), improve parent mental health and related symptoms (Lunsky et al., 2017; Ridderinkhof et al., 2018; Schwartzman et al., 2021), and reduce parenting stress in parents of autistic children and adolescents (Ferraioli & Harris, 2013; Jones et al., 2018). The related mindful parenting intervention (Bögels & Restifo, 2014) has similarly been found to decrease stress in parents of autistic adolescents (de Bruin et al., 2015). Effects of mindfulness-hybrids for parents of autistic children and adolescents have been maintained over 2 (Ridderinkhof et al., 2018; Schwartzman et al., 2021), 3 (Ferraioli & Harris, 2013), and 5 months postintervention (Lunsky et al., 2017).

Interestingly, somewhat less attention has been devoted to the applicability of traditional mindfulness-based stress reduction (MBSR; Kabat-Zinn, 2013) to families of autistic children. MBSR is the most empirically-supported stress-reduction intervention to date, with over three decades of extensive research demonstrating efficacy in reducing stress, anxiety, and depression, and promoting overall well-being across a variety of clinical and nonclinical populations (Grossman et al., 2004). MBSR targets stress reduction by fostering nonreactivity and nonjudgment of internal experiences, which promotes acknowledgment of the experience of stress while reducing the emotional impact (Gu et al., 2015).

Utilizing waitlist-control designs (e.g. Neece, 2014; Neece et al., 2019) and active comparators (e.g. Dykens et al., 2014), several studies have demonstrated the efficacy of Kabat-Zinn (2013) manualized MBSR for improving parenting stress in families of children with heterogeneous IDD diagnoses and chronic conditions. Although these samples have sometimes included autistic children (e.g. Dykens et al., 2014; Neece et al., 2019), few studies have tested MBSR in families of autistic children specifically. Moreover, existing studies that have examined MBSR in parents of autistic children have combined MBSR with other interventions such as the parent-implemented early start Denver model (Weitlauf et al., 2020) or self-compassion interventions (Rojas-Torres et al., 2021). Thus, the unique effects of MBSR on families of young autistic children remain unknown.

Mindfulness interventions, and MBSR in particular, hold promise for reducing stress in parents of young autistic children. However, rigorous testing using a randomized design with an active comparator, a large, well-characterized, and diverse sample, and long-term follow-up is needed to further establish efficacy and support generalizability. The current study addressed these aims by: (1) conducting a population-specific randomized controlled trial of Kabat-Zinn (2013) manualized MBSR intervention involving an active comparison of psychoeducational support (PE) condition, (2) recruiting a sample composed of racially and ethnically diverse families of preschool-aged children with a well-characterized ASD diagnosis, and (3) performing a longitudinal assessment of intervention effects up to 12 months postintervention. We also employed methodologically stringent measurement of parenting stress to enable the use of a latent variable approach, thereby enhancing internal validity and interpretability. We hypothesized that MBSR would be more efficacious in reducing parenting stress than PE as indexed by reductions in parenting stress immediately post-intervention and at 6- and 12-month follow-up.

Method

Participants

Participants included 117 families of autistic children aged 3 to 5 years who participated in the Stress-reduction Techniques for Enhancing Parenting Skills (STEPS) Project. Families were recruited through the community from September 2018 to March 2021. Families were primarily recruited from the Inland Empire Regional Center, which is a government agency that contracts services for individuals with developmental disabilities. Additional recruitment was completed through participating universities, community disability groups, local agencies that provide services for autistic children, local preschools, and community events for families of children with developmental disabilities.

Data were gathered across three separate cohorts, with assessments at baseline, immediate postintervention, and at 6 and 12 months postintervention. Procedures were primarily in person for the first two cohorts. However, due to the COVID-19 pandemic and prohibitions against in-person activities, the 6- and 12-month follow-up assessments for cohort 2 ($n = 36$) were conducted virtually. All procedures for cohort 3 ($n = 51$) were also completed virtually, with the exception of direct assessments of intellectual functioning and receptive language, which were completed once in-person activities resumed postintervention.

Study inclusion criteria were: (a) child community ASD diagnosis—or waitlisted for a community ASD assessment—with diagnostic symptoms verified by study-administered assessments, (b) child age 3 to 5 years, and (c) parent ability to complete study procedures in English. Exclusionary criteria included: (a) positive screen for active parental psychosis, substance abuse, or suicidality according to the associated modules of the Structured Clinical Interview for *DSM* Disorders, Research Version Non-Patient Edition (First et al., 2002); (b) parent participation in an auxiliary mental health treatment or support group at the time of randomization; and (c) child motor impairment that would prevent participation in the parent–child interaction tasks that were part of the larger assessment protocol (e.g. difficulty sitting independently). Families not meeting study eligibility were provided with appropriate community referrals. Table 1 presents sample demographic and clinical information. Most primary caregivers were mothers with relatively diverse racial/ethnical and socioeconomic backgrounds. Over half of the primary caregivers endorsed clinically significant parenting stress at baseline (>85th percentile, Parenting Stress Inventory-Parental Distress scale). Most children were boys; the majority met *DSM* 5: *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM*-5) (American Psychiatric Association, *DSM*-5 Task Force, 2013) criteria for co-occurring ID according to study-administered assessments (IQ and adaptive behavior < 76), and exhibited clinically elevated parent-reported behavior problems (Child Behavior Checklist; Achenbach, 2000).

Procedure

Procedures were approved by the Institutional Review Board of participating universities, with data collection

Table 1. Demographic and clinical characteristics of participants.

	MBSR	PE	Significance test
	(*n* = 59)	(*n* = 58)	
Child characteristics			
Male (%)	78	82.8	$\chi^2(1) = 0.425$, $p = 0.514$
Mean age (*SD*)	4.370 (0.878)	4.375 (0.968)	$t(115) = 0.029$, $p = 0.977$
Race/ethnicity (%)			
White	22	17.2	$\chi^2(1) = 0.425$, $p = 0.514$
Latinx	40.7	48.3	$\chi^2(1) = 0.684$, $p = 0.983$
Black	5.1	5.2	$\chi^2(1) = 0.000$, $p = 0.408$
Asian	3.4	8.6	$\chi^2(1) = 1.423$, $p = 0.233$
Native American	0	0	—
Pacific Islander	0	1.7	$\chi^2(1) = 1.026$, $p = 0.311$
Other	6.8	1.7	$\chi^2(1) = 1.827$, $p = 0.176$
Multiracial	22	17.2	$\chi^2(1) = 0.425$, $p = 0.514$
Mean IQ (*SD*)	68.595 (21.588)	66.750 (18.737)	$t(80) = -0.412$, $p = 0.681$
Mean adaptive behavior (*SD*)	68.234 (10.104)	69.365 (8.843)	$t(97) = 0.594$, $p = 0.554$
Intellectual disability (%)	69.1	66	$\chi^2(1) = 0.115$, $p = 0.735$
Mean ASD symptom level (*SD*)	7.281 (1.611)	7.471 (1.813)	$t(64) = 0.447$, $p = 0.656$
Mean SCQ total score (*SD*)	21.745 (5.376)	20.339 (5.593)	$t(109) = -1.350$, $p = 0.180$
Mean receptive vocabulary score (*SD*)	72.455 (28.166)	64.125 (30.550)	$t(63) = -1.143$, $p = 0.257$
CBCL externalizing problems (*SD*)	68.396 (11.335)	66.491 (11.393)	$t(104) = -0.863$, $p = 0.390$
Clinically elevated CBCL externalizing problems ($T > 63$; %)	67.9	67.9	$\chi^2(1) = 0.000$, $p = 1.000$
Primary caregiver characteristics			
Mean primary caregiver age (*SD*)	34.559 (7.541)	34.672 (7.529)	$t(115) = 0.081$, $p = 0.935$
Primary caregiver female (%)	93.2	87.9	$\chi^2(1) = 0.961$, $p = 0.327$
Primary caregiver race/ethnicity (%)			
White	20.3	22.4	$\chi^2(1) = 0.075$, $p = 0.784$
Latinx	54.2	48.3	$\chi^2(1) = 0.416$, $p = 0.519$
Black	5.1	6.9	$\chi^2(1) = 0.171$, $p = 0.680$
Asian	3.4	8.6	$\chi^2(1) = 1.423$, $p = 0.233$
Native American	0	0	—
Pacific Islander	0	1.7	$\chi^2(1) = 1.026$, $p = 0.311$
Other	3.4	1.7	$\chi^2(1) = 0.325$, $p = 0.569$
Multiracial	13.6	10.3	$\chi^2(1) = 0.287$, $p = 0.592$
Primary caregiver education (%)			$\chi^2(4) = 5.064$, $p = 0.281$
High school or less	31	17.2	
Some college	22.4	20.7	
Technical degree/AA	19	34.5	
Bachelor's degree	13.8	15.5	
Graduate degree	13.8	12.1	
Primary caregiver marital status (%)			$\chi^2(5) = 7.935$, $p = 0.160$
Married	55.9	67.2	
Living together	15.3	13.8	
Separated	3.4	8.6	
Divorced	1.7	0	
Widowed	1.7	3.4	
Single	22	6.9	
Mean primary caregiver mainstream acculturation status (VIA) score (*SD*)	67.660 (16.529)	67.210 (15.126)	$t(100) = -0.144$, $p = 0.886$
Parental depression (CES-D) score (*SD*)	19.481 (12.690)	16.962 (9.715)	$t(103) = -1.140$, $p = 0.257$
Primary Caregiver Stress			
Mean parental stress index-short form parental distress subscale (*SD*)	37.472 (9.192)	37.434 (8.354)	$t(104) = -0.022$, $p = 0.982$

(Continued)

Table 1. (Continued)

	MBSR	PE	Significance test
	(*n* = 59)	(*n* = 58)	
Mean family impact questionnaire, negative impact subscale (*SD*)	37.170 (13.964)	36.423 (12.632)	$t(104) = -0.289$, $p = 0.773$
Mean parenting daily hassles, intensity subscale (*SD*)	59.660 (17.402)	58.152 (19.428)	$t(104) = -0.421$, $p = 0.675$
Family characteristics			
Annual gross family income (%)			$\chi^2(4) = 2.607$, $p = 0.626$
<$30,000	25.4	28.3	
$30,000–<$50,000	18.6	15.1	
$50,000–<$70,000	15.3	22.6	
$70,000–<$90,000	13.6	17	
>$90,000	27.1	17	
Primary home language (%)			$\chi^2(2) = 5.698$, $p = 0.058$
English	91.5	80.7	
Spanish	0	8.8	
Other	8.5	10.5	
Services in past 6 months			
Primary caregiver mental health services (Yes; %)	34.5	31.6	$\chi^2(1) = 0.110$, $p = 0.741$
Primary caregiver parenting classes (Yes; %)	15.5	13.8	$\chi^2(1) = 0.069$, $p = 0.793$
Any target child services (Yes; %)	87.9	91.4	$\chi^2(1) = 0.372$, $p = 0.542$
Any target child ABA (Yes; %)	56.1	53.4	$\chi^2(1) = 0.084$, $p = 0.772$
Mean number of months of target child ABA (*SD*)	4.695 (8.105)	4.966 (8.792)	$t(115) = -0.563$, $p = 0.886$
Mean number of sessions of target child ABA (*SD*)	11.271 (16.329)	9.810 (11.254)	$t(115) = 0.173$, $p = 0.575$

Note. ABA: applied behavior analysis therapy; CBCL: Child Behavior Checklist; CES-D: Center for Epidemiologic Studies Depression Scale; MBSR: Group receiving mindfulness-based stress reduction; PE: group receiving psychoeducational support; SCQ: Social Communication Questionnaire; VIA = Vancouver Index of Acculturation.

centered at a single site. Interested parents contacted the research team by phone, postcard, or the study website. Following an initial phone screening, eligible families were scheduled for a baseline laboratory assessment and provided informed consent.

Baseline assessment. A battery of standardized psychological assessments were administered to assess child cognitive functioning (Stanford-Binet-5 ABIQ; Roid, 2003), child receptive language (Peabody Picture Vocabulary Test-4; Dunn & Dunn, 2007), and ASD diagnostic status. Parents also participated in an interview to collect information on family demographics and service utilization, and to evaluate the child's adaptive behavior (Vineland Adaptive Behavior Scales-3; Sparrow et al., 2016). In addition to laboratory assessments, parents completed a packet of questionnaires.

For Cohorts 1 and 2, ASD diagnostic confirmation was completed through a multimethod assessment involving the administration of a standardized parent-report form, the Social Communication Questionnaire (SCQ; Rutter et al., 2003a), and direct testing with Autism Diagnostic Observation Schedule-2 (ADOS-2; Lord et al., 2012). One child did not meet the ADOS-2 criterion for ASD classification but was retained following completion of an in-depth clinical best estimate. This child had an existing community diagnosis of ASD and met the age-adjusted clinical criterion on the SCQ (Corsello et al., 2007). Due to COVID-19 prohibitions on in-person activities, Cohort 3 diagnostic status was ascertained using a battery of parent-report measures involving two standardized questionnaires—the SCQ and the Social Responsiveness Scale-2 (SRS-2; Constantino & Gruber, 2012)—administration of a comprehensive semistructured interview, the Autism Diagnostic Interview-Revised (ADI-R; Rutter et al., 2003b). Nine children did not meet the diagnostic threshold on the ADI-R. Six of these children were retained in the sample following completion of clinical best estimate procedures. All six of these children had an existing community diagnosis of ASD and met the age-adjusted clinical threshold on the SCQ (Corsello et al., 2007). Five of the six children also met clinical criteria on the SRS-2.

At the conclusion of the baseline visit, families were randomly assigned to MBSR (*n* = 59) or PE (n = 58). Group

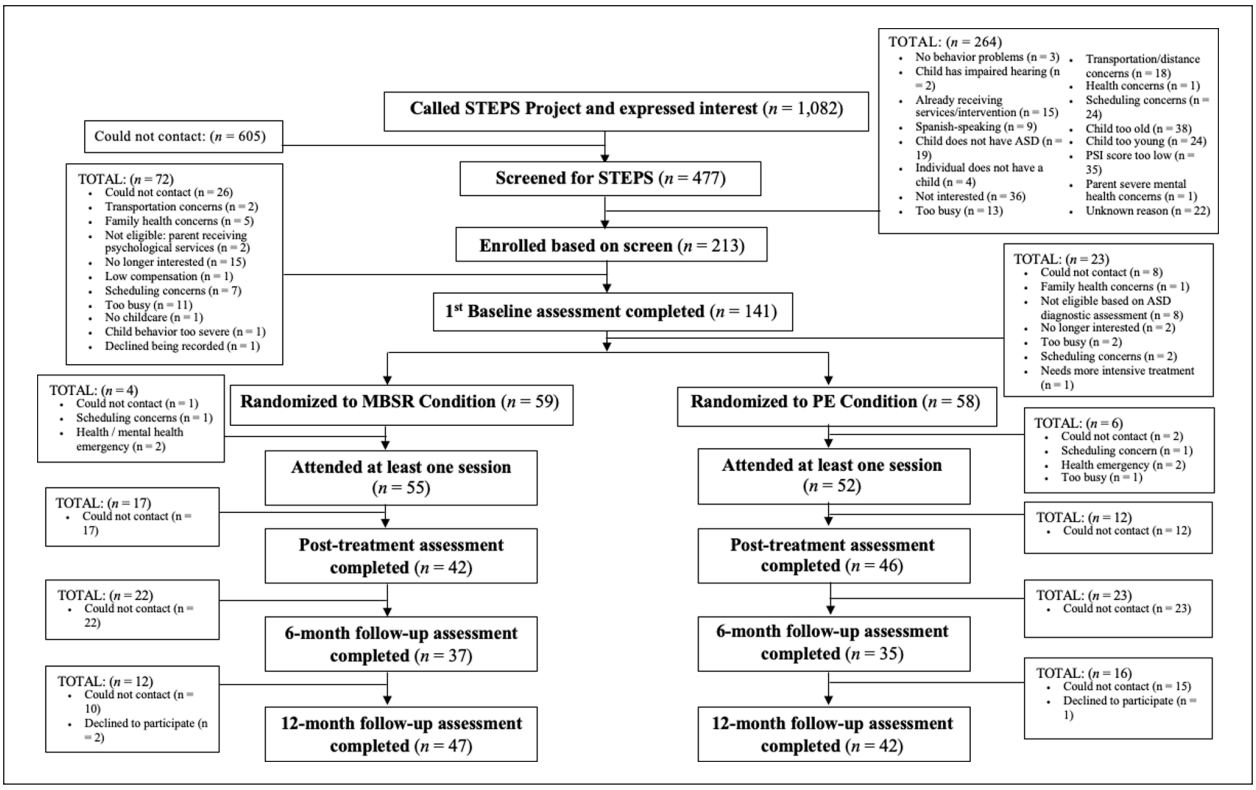

Figure 1. CONSORT diagram.

size ranged from 14 to 26 for MBSR, and 16 to 21 for PE, $\chi^2(2) = 0.757$, $p = 0.685$. Figure 1 depicts the CONSORT diagram and flow through the study.

Participation enhancement. Following intervention assignment, we deployed an adapted version of Nock and Kazdin's (2005) *Participation Enhancement Intervention* (PEI) at the conclusion of the baseline visit (see also Fenning, Butter, Macklin et al., 2022; Fenning, Butter, Norris et al., 2022). Our adapted PEI represented a brief motivational interviewing module designed to optimize intervention engagement and reduce anticipated barriers. We worked individually with parents for 10 to 30 min to develop a collaborative plan to promote parent-identified intervention goals and to proactively address potential barriers to intervention engagement. PEI sessions were also deployed as needed to support engagement throughout the intervention. Planned boosters were delivered after session 6 and postintervention to promote follow-up.

MBSR intervention. The MBSR intervention followed the established MBSR manual (Kabat-Zinn, 2013) and included eight weekly 2-h group sessions, a 6-h meditation retreat on the weekend after session 6, 30–45 min of daily home practice guided by instructional audio, and an MBSR parent workbook. Formal mindfulness exercises aimed to increase the capacity for mindfulness and included body scans, mindful yoga, and sitting meditation. Participants were also taught to practice mindfulness informally in everyday activities. In addition, during groups, participants broke into dyads to discuss daily homework practice and met as a large group to discuss mindfulness practice in everyday life. The MBSR intervention was delivered by a certified MBSR instructor with over 20 years of experience and was co-led by a clinical psychology doctoral student who had experience with MBSR and received weekly supervision from the certified instructor.

Psychoeducational support. In order to provide a rigorous test of the efficacy of MBSR in reducing parenting stress, we employed an active comparator matched for contact. The PE group ran concurrently with the MBSR group, and was conducted at the same time and location, but on different weekdays in order to avoid intervention contamination. The PE condition consisted of 8 weekly 2-h sessions; a 6-h family resource fair after session 6; daily homework that included monitoring progress on goals identified at the end of each session; and a parent workbook that provided information regarding their child's development, disability, and associated considerations. To enhance external validity, the PE group was modeled after the support groups offered to parents of autistic children in the local community. Each session had a general topic for discussion (e.g. Preparing for Individualized Education Plan meetings, Parent Advocacy, Sibling Issues). At the start of each session, group leaders provided didactic instruction

on the topic, then facilitated small- and large-group discussion. PE group sessions were led by parents of children with developmental disabilities who were identified as local community leaders working in the field. The PE groups were also co-led by clinical psychology doctoral students who received weekly supervision with a clinical psychologist and parent group leader.

Intervention adaptations for COVID-19. Interventions for Cohort 3 were delivered virtually due to pandemic-related restrictions on in-person activities. Families were provided with a tablet and/or an Internet hotspot as needed to facilitate intervention participation. Virtual session duration and format were consistent with in-person groups, with virtual groups using online breakout rooms to facilitate dyadic and small group discussions. The 6-h meditation retreat (MBSR) and the resource fair (PE) were also conducted online.

Childcare. Childcare was provided for parents during all in-person MBSR and PE sessions. Given the virtual format, Cohort 3 did not receive childcare support, although we did troubleshoot barriers to participation associated with childcare needs.

Postintervention assessment. After completion of the intervention, parents participated in postintervention assessments as well as 6- and 12-month follow-up assessments. Assessments followed baseline procedures with the exception of child testing and the Vineland, which were not conducted. Study staff collected updated demographic and service information and parents completed the questionnaire packets again.

Community involvement statement. Family members of autistic individuals have been involved in all aspects of this study. Recruitment was conducted in partnership with community programs, and family members and community partners were involved in the development and implementation of PE intervention.

Measures

Demographic information. Child and parent ages, races, ethnicities, family income, child diagnoses, and services received were collected via parent interviews.

Parenting stress measures. To comprehensively examine parenting stress, we assessed: general distress, stress specific to the child's condition, and daily parenting hassles. The *Parental Distress* subscale of the *Parenting Stress Index-4, Short Form* (PSI4-SF-PD; Abidin, 2006) was used to assess parents' perceived general distress in the parenting role (study alphas 0.83–0.88). The *Negative Impact* scale of the *Family Impact Questionnaire* (FIQ-NI; Donenberg & Baker, 1993), which asks about the child's impact on the family relative to the impact of other children his or her age, was used to assess stress specific to the autistic child (study alphas 0.87–0.92). Finally, the *Intensity* subscale of the *Parenting Daily Hassles* questionnaire (PDH-I; Crnic & Greenberg, 1990) was used to assess parents' perceived intensity of daily stressors related to caregiving demands and responsibilities (study alphas 0.90–0.94).

Statistical analysis

We performed intention-to-treat analyses using a series of two-level linear growth curve models to examine the outcome variable of parenting stress. Repeated measures across time at Level 1 were nested within individuals (primary caregivers) at Level 2. Time was defined according to study time points (baseline, postintervention, 6-month and 12-month follow-up), and was centered at baseline for purposes of improved interpretability. Parenting stress was a latent variable defined by three indicator variables: PSI-4-SF-PD, FIQ-NI, and PDH-I. The FIQ-NI had the strongest overall reliability ($\alpha = 0.92$), and was therefore used to set the metric for the parenting stress factor. The data were evaluated for and met the assumptions of multilevel modeling (e.g. Singer & Willett, 2003).

Preliminary analyses were conducted using SPSS 28 to identify potential covariates to include in the main analyses. We examined associations between each of the variables listed in Table 1 and all outcome indicator variables at each study time point. The following Level-2 variables were then selected as covariates due to having significant relationships with our outcome indicator variables: whether or not anyone in the family had received any type of mental health services in the 6 months prior to the baseline assessment (0 = No, 1 = Yes) and the number of months that the target child had received applied behavior analysis services at baseline; these two variables were centered to improve interpretability, $ps < 0.05$.

We also tested rates of attrition between the intervention groups. Individuals who were randomized but did not complete a post-intervention or follow-up assessment were defined as study dropouts There were no significant differences in attrition between the MBSR and PE groups, between intervention modalities (in-person vs virtual), or across the three study cohorts. In addition, we tested for differences between intervention completers and dropouts based on variables in Table 1. Intervention completers differed from those who dropped out in that they were more likely to have received mental health services for their child's primary/secondary diagnosis and the target child was less likely to be Latinx. Mental health services were included as a covariate in our statistical models due to associations with all three outcome variables at multiple time points. Child ethnicity was not included as a covariate because it was not consistently associated with any of our outcome variables over time.

Finally, we tested for differences between the study cohort affected by COVID (Cohort 3) and cohorts not affected by COVID (Cohorts 1 and 2) on all variables listed in Table 1 and all variables included in the multilevel models. There were few differences between the groups, and none of these differences were statistically significant after correcting for elevated familywise Type I error due to conducting so many analyses.

Multilevel models were tested in the following order: (1) the unconditional means model, (2) the unconditional growth model, (3) a model in which intervention group (0 = PE, 1 = MBSR) was allowed to predict baseline parenting stress, (4) a model in which Level 2 covariates (described above) were allowed to predict baseline parenting stress in addition to intervention group, and (5) a model in which intervention group was allowed to predict change in parenting stress over time. Each model was tested to determine if it fit the data significantly better than the previous model.

A missing values analysis indicated rates of missingness that varied from 0% to 35.7% (PDH-I), and missingness exceeded the traditionally recommended cutoff of 5% for our three outcome indicator variables (Graham, 2009). Therefore, we imputed missing data using Blimp 3 (Keller & Enders, 2021), which utilizes Bayesian imputation and an iterative Markov chain Monte Carlo (MCMC) algorithm, and assumes that the data are missing at random. This imputation method is preferable to more commonly used modern approaches such as multiple imputation and full information maximum likelihood estimation because it accounts for the multilevel structure of the data (Enders et al., 2020). We assessed convergence using potential scale reduction factor diagnostics and trace plots, and assessed whether the number of estimates for each parameter was sufficient by examining a number of effective sample sizes (Gelman et al., 2014; Gelman & Rubin, 1992). Based on these metrics, we specified two MCMC chains with between 5000 and 150,000 burn-in iterations and post burn-in iterations, depending on the model. Twenty multiply imputed data sets per model were then saved and imported into RStudio 2022.07.0 for multilevel analysis.

Blimp 3 was used for main effects and simple slopes analyses following significant cross-level interactions. Blimp provides the results of Bayesian estimation, which include posterior median estimates of parameters and their associated 95% credible intervals (95% CrIs). A Bayesian CrI is interpreted as the probability that the true effect lies within a specified interval, given the evidence provided by the observed data (Hespanhol et al., 2019). The values of Bayesian credible intervals and traditional frequentist confidence intervals are often nearly identical in practice (Albers et al., 2018), and therefore we interpret a 95% CrI that does not include one as representing a statistically significant effect at $p < 0.05$.

Results

Intervention fidelity

Both groups were monitored for adherence to intervention targets. Independent research assistants observed each intervention session and completed intervention fidelity checklists. Interventionist fidelity scores were calculated according to the percentage of intervention components completed as outlined in the MBSR and PE group manuals. Collapsing across modalities and cohorts, the MBSR interventionists completed 98.03% of the possible fidelity items and the PE interventionists completed 97.89% of the possible fidelity items, $t(4) = -0.112$, $p > 0.05$, 95% CI (−3.51, 3.23). Overall total contact time for the MBSR group across cohorts was 1247.00 min ($SD = 58.39$) and 1107.67 min ($SD = 161.33$) in the PE group, which was not significantly different, $t(4) = -1.41$, $p > 0.05$, 95% CI (−414.35, 135.69).

Parenting stress

The fifth and final model, in which the intervention group was allowed to predict change in parenting stress over time, fit the data best (see Table 2). In that model, there were no differences in parenting stress at baseline between MBSR and PE ($b = 0.194$, $p > 0.05$). Parenting stress significantly decreased over time in both groups ($b = -2.647$, $p < 0.0001$), but that relationship was significantly stronger for participants in MBSR than for participants in PE ($b = -1.970$, $p < 0.05$). On average, parental distress decreased by 4.694 points at each time point for participants in MBSR (95% CrI (−6.055, −3.417)), and by 2.620 points at each time point for participants in PE (95% CrI (−4.018, −1.286)). Simple slopes analyses indicated that there was a significant difference in parental distress between the MBSR and PE groups at 12-month follow-up, such that the median estimate of the latent parental distress score was 5.906 points lower for the MBSR group than the PE group at that time point (95% CrI (−11.145, −0.720), respectively). There were no significant differences in parenting stress between the groups at baseline, immediate postintervention, or 6-month follow-up (95% CrI −3.674, 4.153), 95% CrI (−5.292, 1.701), and 95% CrI (−7.897, 0.161), respectively; see Figure 2). Our model explained approximately 46.0% of the variance in parental distress at Level 1, 22.8% of the variance in the intercept (average baseline parental distress score) at Level 2, and 29.3% of the variance in the slope (change in parental distress over time) at Level 2.

Discussion

The current study stringently tested MBSR (Kabat-Zinn, 2013) efficacy in reducing parenting stress for parents of preschool-aged autistic children. Utilizing a racially/

Table 2. Results of multilevel models predicting initial status and change in parenting stress over time.

		Parenting stress
Fixed effects		
Initial status (π_{0i})	Intercept (γ_{00})	−0.217
	Intervention Group (γ_{01})	0.194
	Mental Health Services (γ_{02})	4.653*
	Months of ABA (γ_{03})	0.365**
Rate of change(π_{1i})	Intercept (γ_{10})	−2.647***
	Intervention Group (γ_{11})	−1.970*
Random effects		
Level 1	Within-Person (σ^2_e)	36.968
Level 2	Initial Status ($\sigma^2\zeta_0$)	52.94
	Rate of Change ($\sigma^2\zeta_1$)	3.919
R^2	R^2e	0.460
	R^20	0.228
	R^21	0.293

Note. ABA: applied behavior analysis therapy.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

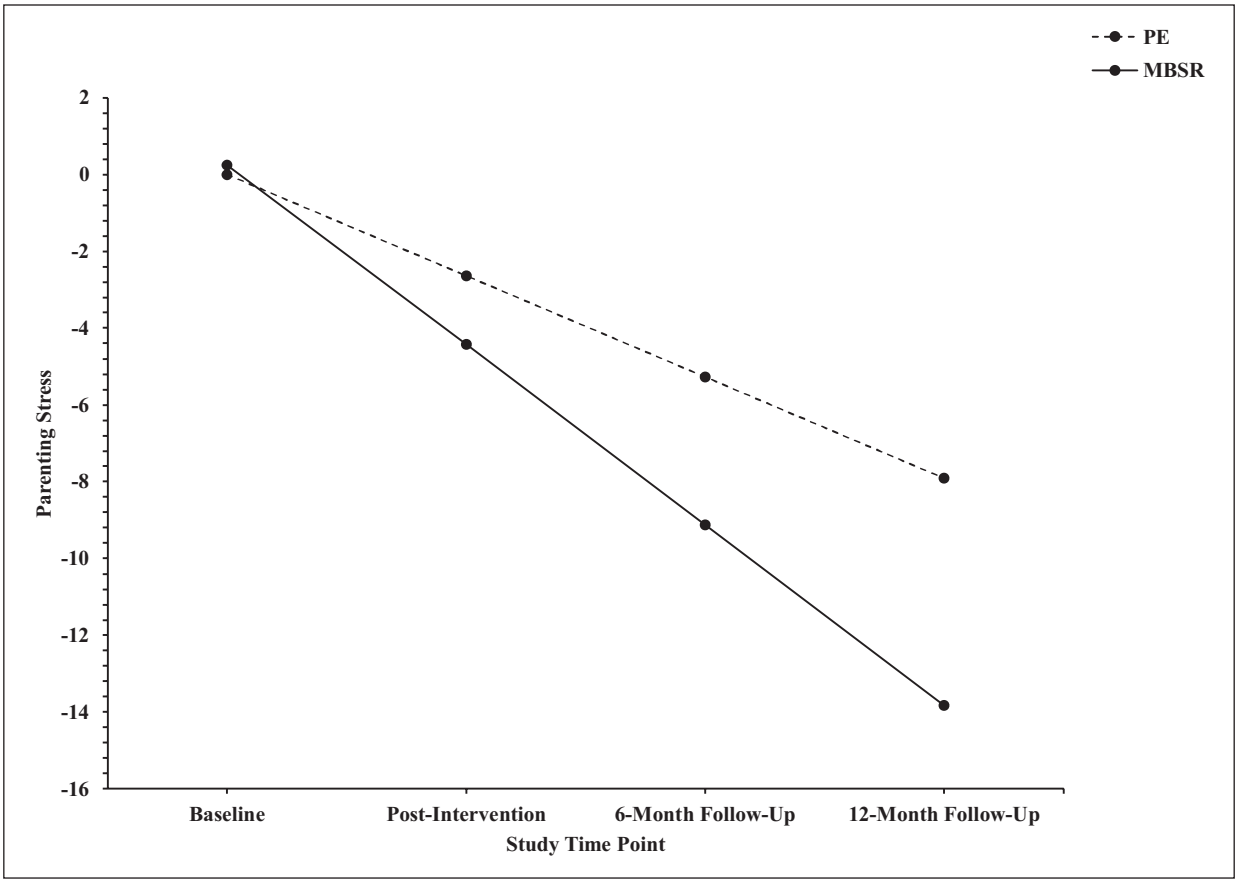

Figure 2. Change in parenting stress over time by intervention group.
Note. MBSR: mindfulness-based stressed reduction group; PE: psychoeducation group. Graph is adjusted for family mental health services in the 6 months prior to baseline and number of months of ABA at baseline. Parenting stress latent variable scores are reported.

ethnically and socioeconomically diverse sample, we employed a methodologically rigorous design involving an active comparator, multiple measures of parenting stress, and long-term follow-up. All parents reported reduced parenting stress over time. However, MBSR reduced parenting stress more than did PE, and the benefit of MBSR increased

over time, with significant differences emerging between groups at the final 12-month follow-up.

Although MBSR outperformed PE in reducing parenting stress over time (i.e. at 12-month follow-up), comparable improvements in parenting stress among parents in PE up to 6 months postintervention suggest the efficacy of both stress-reduction interventions for parents of young autistic children. Findings may also point to the benefit of PE in directly addressing the social support, informational, and services navigation needs of this population, particularly during a sensitive period for early intervention. Nonetheless, the informational and supportive benefits of PE may reach a ceiling. On the other hand, the steeper improvements found among the MBSR group (versus PE) at 12 months postintervention may reflect parents' sustained use—and continued benefit from—stress-reduction techniques taught in MBSR. Evidence of steady improvements in parenting stress up to 12 months postintervention contrasts with existing literature which has assessed outcomes up to 6 months postintervention at most and has largely found intervention effects to taper over time (e.g. Weitlauf et al., 2020).

A key contribution of the current study is the inclusion of an active comparator involving a manualized psychoeducation and support intervention, a service which is commonly offered to parents of children with developmental disabilities (Hastings & Beck, 2004) but lacks sufficient efficacy data. Our trial thus provides foundational evidence of the stress-reduction benefits of PE for underserved families. Although MBSR produced greater and more prolonged stress amelioration, evidence that both approaches confer benefit provides compelling options for supporting parents of young autistic children. Future research would benefit from examining potential moderators of intervention outcomes to further refine and individualize clinical decision-making.

This study possesses several strengths and addresses important gaps in the current literature. First, we utilized a well-characterized and racially, ethnically, and socioeconomically diverse sample. We assessed three different types of parenting stress that have been investigated in families of autistic children (general distress, stress specific to the child's condition, and daily parenting hassles) to comprehensively examine this construct. In addition, we employed a longer follow-up period than existing literature, which enhances the external validity of our findings. Taken together, this study provides the most rigorous test of the efficacy of MBSR for parents of autistic children to date.

Findings from this study must also be considered in the context of several limitations. The onset of the COVID-19 pandemic and associated restrictions on in-person activities changed our procedures mid-study and likely impacted parents' stress levels and experiences in the interventions. In addition, while the use of an active comparator was a significant strength of the study's design, we did not have a no-intervention control group and therefore we cannot evaluate the benefit of the MSBR of PE interventions relative to normative changes in parenting stress over time. However, a recent waitlist-control mindfulness intervention for parents of autistic children found that control participants significantly increased parenting stress over the course of 2 months without treatment (Schwartzman et al., 2021). We speculate that our underserved parents would have followed a similar or exacerbated trajectory in a no-intervention control group. Given the risks of untreated stress in this population and our focus on families experiencing high levels of strain, we opted for a stringent active comparison condition.

The present study explicitly focused on parenting stress. Future studies should examine the potential benefits of MBSR and PE for other facets of parental well-being (e.g. anxiety, life satisfaction, self-efficacy), parenting cognitions (e.g. parenting self-efficacy), and parenting behavior. Indeed, evidence suggests that parenting cognitions and behaviors may underlie associations between parenting stress and child externalizing behavior problems and that low resources may intensify these effects (Stephenson et al., 2022). Thus, future studies should also examine how changes in parent-level factors following MBSR and PE influence child outcomes in this population. Finally, since MBSR is an intensive intervention that requires a highly trained interventionist that may not be available in most clinical settings, a future dismantling study identifying the key elements, intensity, and training required to enact significant change would facilitate broader dissemination, particularly to underserved communities.

MBSR and PE were efficacious in reducing stress for parents of preschool-aged autistic children. Stress amelioration was especially pronounced and lasting for parents receiving MBSR. Our results may inform efforts to disseminate evidence-based interventions that attenuate parenting stress in this population during a critical window for early intervention.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Informed consent

Informed consent was obtained from all individual participants included in the study. Procedures were approved by the Institutional Review Board at Loma Linda University in collaboration with the additional participating universities.

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