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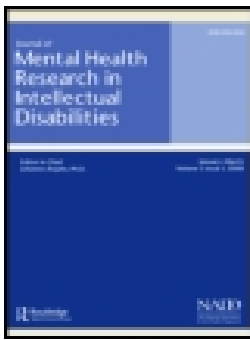


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To cite this article: Hadley A. McGregor , Catherine M. Sanner & Cameron L. Neece (2020): Effects of MBSR Parent Intervention on Internalizing Problems in Children: ASD Status as a Moderator, Journal of Mental Health Research in Intellectual Disabilities

To link to this article: <https://doi.org/10.1080/19315864.2020.1815913>



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Effects of MBSR Parent Intervention on Internalizing Problems in Children: ASD Status as a Moderator

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ABSTRACT

Introduction: Children with developmental delays (DD), particularly autism spectrum disorders (ASD), are at high risk for increased levels of behavior problems and developing internalizing problems. While previous literature has highlighted the impact of parental stress on the development of behavioral problems broadly in children with DD, research on the relation between parenting stress and internalizing problems in children with ASD is scarce. Growing evidence has supported Mindfulness-Based Stress Reduction (MBSR) as an effective intervention for reducing stress among parents of children with DD. These reductions in parent stress are also associated with subsequent reductions in their children's behavior problem; however, to our knowledge, the effects of MBSR and reductions in parent stress on internalizing problems in children with DD have not been examined.

Method: The current study utilized data from Mindful Awareness for Parenting Stress (MAPS) which consisted of families of 80 preschool children with developmental delays (DD) whose parents reported high levels of stress. Specifically, we investigated whether decreases in parenting stress as a result of engagement in a MBSR intervention would lead to reductions in internalizing behavior problems among children with DD, and whether this relation was moderated by the child's ASD status. Additionally, we examined whether individual increases in the mindful facets of acting with awareness and nonjudgment, from pre- to post- treatment, would lead to reductions in internalizing problems among children with DD, and whether this relation was moderated by the child's ASD status.

Results: Children of parents in the MBSR treatment group had greater reductions in internalizing problems compared to children whose parents were in the waitlist-control group, $b = -5.71$, $p < .05$. We also found that children of parents who reported greater increases in acting with awareness post-treatment had a greater reduction in internalizing problems, $b = -2.57$, $p < .05$. Additionally, children whose parents had greater increases in nonjudgment post-treatment had a greater reduction in internalizing problems, $b = -1.85$, $p < .05$. However, ASD status was not a significant moderator in either analysis, $ps > .05$.

KEYWORDS

Autism spectrum disorders;
developmental delay; MBSR;
parenting intervention;
internalizing problems

Conclusions: These findings have important implications regarding the relation between parenting stress and internalizing problems in children with DD. This treatment offers a novel approach to treating comorbid internalizing problems in children with DD. Parents' use of MBSR provides a method of early intervention, which may ameliorate the development of internalizing problems over time. The current study helps to inform future parenting interventions by highlighting the importance of addressing specific facets of mindfulness in interventions which may lead to greater reductions in internalizing problems in vulnerable populations such as children with DD.

INTRODUCTION

Research has shown that children and adolescents with developmental delays (DD), specifically children with autism spectrum disorders (ASD) are at high risk for developing comorbid internalizing problems and disorders (De Ruiter et al., 2007; Matson et al., 2010; Mayes et al., 2011). In fact, studies highlighting the prevalence of internalizing problems have shown that roughly 10% and 22% of children with DD (Dekker & Koot, 2003; Emerson & Hatton, 2007; Roberts et al., 2007). Perhaps even more stark is that approximately 39.6 to 70% of children and adolescents with ASD, specifically, meet criteria for at least one anxiety disorder (Simonoff et al., 2008; Van Steensel et al., 2011). Furthermore, around 11 to 30% of children and adolescents with ASD exhibit clinical levels of symptoms of depression (Leyfer et al., 2006; Rosenberg et al., 2011; Strang et al., 2012). Comparatively, only 7.1 to 12% of typically developing (TD) children and adolescents exhibit anxiety problems (Costello et al., 2005) and 3.2% show signs of depression (Ghandour et al., 2019). The discrepancy between prevalence rates of internalizing problems in TD children and adolescents compared to those with ASD, has made it difficult, clinically to parse out internalizing problems from core features of ASD (Vasa & Mazurek, 2015). Regardless of whether or not anxiety is a feature of ASD or a stand-alone diagnosis, it is important to address internalizing problems early on to better improve later life outcomes.

Internalizing Problems and Implications

Internalizing problems typically include symptoms of depressive disorders, anxiety disorders, somatic complaints, reticence, fearfulness, oversensitivity, withdrawal, and in some instances, suicidal ideation, which all reflect a child's internal emotional or psychological state (Davis et al., 2011; Liu et al., 2011). Internalizing problems are associated with numerous unfavorable long-term outcomes such as educational problems, entanglements with the welfare and justice systems, teenage suicide, and higher likelihood of developing an

externalizing disorder (Liu et al., 2011). Furthermore, internalizing problems have also been linked to developing comorbid substance use disorders, or somatoform disorders (Essau et al., 2002; Woodward & Fergusson, 2001), as well as long-term reduced life satisfaction, marital dissatisfaction, and low self-esteem (Gotlib et al., 1998; Hughes & Gullone, 2008). Additionally, unlike externalizing behavior problems, which are often apparent to family members and teachers, internalizing problems may go undetected leading to reduced rates of seeking behavioral interventions (Tandon et al., 2009). Therefore, it is important to proactively identify internalizing problems in children and associated risk factors in order to provide a more effective treatment method.

Comorbidity of Internalizing Problems in Children with DD

Children with DD are at an increased risk for developing comorbid internalizing problems (Bitsika et al., 2016; Emerson, 2003). Additionally, research has also shown that children with ASD, specifically, exhibit internalizing problems even more frequently than children with DD (Davis et al., 2010; Evans et al., 2005; Gotham et al., 2015). Furthermore, research has found that children with ASD and co-occurring internalizing disorders such as anxiety disorders are significantly more likely to engage in self-injurious behaviors and display depressive symptoms, when compared to children with ASD without comorbid internalizing problems (Kerns et al., 2015). This finding further highlights that internalizing problems is not necessarily inherent features of ASD, but instead separate, comorbid problems that require intervening. Additionally, although some studies suggest that children with ASD exhibit similar presentations of internalizing problems to those of TD children, it has been found that children with ASD tend to display overall higher rates and more intense symptomology of internalizing problems (Park et al., 2014). For instance, research has shown that children with ASD tend to exhibit higher rates of specific phobias, even after accounting for overlapping features with ASD symptomology, and more intense anxiety and avoidant symptoms when compared to other children with DD and TD children (Davis et al., 2010; Evans et al., 2005). These findings show that there does appear to be some variation in expression of internalizing problems (e.g., intensity or symptomology) in children with ASD when compared to children with DD or TD children, although the research is scarce. Similar to that of TD children, these problems can be detrimental to physical and psychological health, performance in school, and employment opportunities later in life (Merrell, 2008; Merrell & Walker, 2004). Additionally, if left unidentified and untreated, these problems may continue throughout the lifespan and become more severe (Davis et al., 2008; Spence et al., 2001). It is for these reasons why it is

important to intervene early in development, to potentially bypass negative long-term consequences.

Family Factors

Although the etiology of internalizing problems in children with DD is largely inconclusive, previous research has highlighted the relationship between childhood internalizing problems and parenting stress. For instance, parents of children with DD tend to have higher levels of parenting stress when compared to parents of TD children (Craig et al., 2016; Woodman et al., 2016). These findings may be particularly salient for children with ASD, specifically, as research has shown that parents of children with ASD reported having lower subjective well-being and increased psychological stress when compared to parents of children without ASD (Costa et al., 2017). Furthermore, regarding the relation between parenting stress and the development of behavior problems in children with DD, some research has highlighted that this relation may be bidirectional (Baker et al., 2003; Neece et al., 2012; Orsmond et al., 2003). However, these findings have been inconsistent (Totsika et al., 2013) and require further research. Nevertheless, parental stress has been associated with the development of internalizing problems and mental disorders among children with DD (Baker et al., 2010; Baker et al., 2002) with an even stronger association for children with ASD, specifically (Bauminger et al., 2010). These studies suggest that parental stress may have a profound impact on childhood internalizing problems. Additionally, these findings highlight the need for interventions that target the relation between parenting stress and internalizing problems comorbid in children with DD, specifically ASD.

Mindfulness-Based Stress Reduction (MBSR)

MBSR is a manualized intervention that teaches mindfulness meditation practice to reduce physiological and psychological symptoms of anxiety and panic (Kabat-Zinn et al., 1992). Research has shown that parents and caregivers of children with DD who participated in mindfulness interventions reported less parenting stress (Bazzano et al., 2015; Beer et al., 2013; Chan & Neece, 2017; Neece, 2014), as well as reductions in anxiety (Benn et al., 2012) and depression (Dykens et al., 2014). Additionally, parents of children with DD who participated in general MBSR practices saw decreases in externalizing problems such as aggression, self-injury, noncompliance (Singh et al., 2006) and an increase in social behavior in their children (Singh et al., 2007). Furthermore, research has shown TD children and adolescents whose parents participated in MBSR reported reduction in internalizing problems such as symptoms of anxiety and

depression (Geurtzen et al., 2015; Parent et al., 2016). However, research pertaining to this relation in children with ASD specifically is very limited.

Within the framework of MBSR, there are five underlying constructs of mindfulness: non-judgment, acting with awareness, observing, describing, and non-reactivity (Baer et al., 2006). Research has shown that increases in these specific facets are indirectly related to reductions in TD children's internalizing problems through methods of mindful parenting (Han et al., 2019). However, although non-reactivity, describing, and observing have not been consistently linked to reductions in stress or internalizing problems (Brown et al., 2015; Bullis et al., 2014; Desrosiers et al., 2013), facets such as acting with awareness and non-judgment have specifically been shown to be key components for distress tolerance, as well as for reductions in internalizing problems such as anxiety and depression (Brown et al., 2015). Additionally, parents of TD children who act with more awareness of both their children's emotions and their own emotions, may be more responsive to their child's needs and less dismissing of their child's emotions (Duncan et al., 2009). For instance, children whose parents display more awareness of their needs and provide reassurance to their children report lower levels of internalizing problems (Sluis et al., 2015). Furthermore, the facet of nonjudgment has also been shown to be related to reductions in internalizing problems in TD children and adolescents (Parent et al., 2016). However, despite these findings, research that specifically investigates the relations between increase in parental acting with awareness or nonjudgment and internalizing problems in children with DD, specifically ASD, is limited.

AIMS AND HYPOTHESES

The proposed study aimed to examine whether parents' use of MBSR leads to reduction in internalizing problems for young children (ages 3 to 5) with DD, as well as investigate specific domains of mindfulness that may account for these changes. Additionally, due to the high rate of comorbid internalizing problems (De Ruiter et al., 2007; Matson et al., 2010; Mayes et al., 2011) and noticeable differences in symptomology (Kerns et al., 2015) in children with ASD, we investigated child's ASD status as a moderator of the relation between MBSR and internalizing problems. The following questions were examined:

1a. Does parent participation in an MBSR intervention predict internalizing problems in children with DD post-treatment? We hypothesized that children of parents who participated in an MBSR intervention would show greater reductions in internalizing problems post-treatment when compared to children of parents who were enrolled in the waitlist-control group.

1b. Is the relation between MBSR participation and childhood internalizing problems moderated by child ASD status? We hypothesize that parents in the MBSR group who have children with ASD will show the greatest reductions in

child internalizing problems, compared to parents in the waitlist-control group.

2a. Within the immediate MBSR treatment group, does parent mindful acting with awareness predict child internalizing problems in children with DD post-treatment? We hypothesized that children whose parents demonstrate a greater increase of mindful acting with awareness will have greater reductions in internalizing problems post-treatment.

2b. Within immediate MBSR treatment, is the relation between mindful acting with awareness and child internalizing problems post-treatment moderated by child ASD status? We hypothesized that children with ASD whose parents have greater increases of mindful acting with awareness have greater reductions in internalizing problems post-treatment.

3a. Within immediate MBSR treatment, does parent mindful nonjudgment predict child internalizing problems in children with DD post-treatment? We hypothesized that children whose parents demonstrate a greater increase of mindful nonjudgment will have greater reductions in internalizing problems.

3b. Within immediate MBSR treatment, is the relation between mindful nonjudgment and child internalizing problems in children with DD moderated by child ASD status? We hypothesized children with ASD whose parents who engage in greater levels of nonjudgment will have greater reductions in internalizing problems.

METHODS

Participants

This study used data from the Mindful Awareness for Parenting Stress (MAPS). We recruited 80 children with DD and ASD and their parent(s) to participate in this study. See [Table 1](#) for demographic information on participants of both the immediate MBSR treatment group and the waitlist-control group. The primary caregiver was responsible for completing all

Table 1. Demographic characteristics of participants by treatment group and tests of group differences.

	Treatment (<i>n</i> = 39)	Control (<i>n</i> = 41)	<i>t</i>	χ^2
<i>Child Characteristics</i>				
% Male	66.70	75.60		$\chi^2(1) = .78$
% Caucasian	28.20	22.00		$\chi^2(1) = .42$
<i>M</i> Age in Years (<i>SD</i>)	4.01 (0.94)	4.34 (1.05)	<i>t</i> (78) = 1.51	
% ASD	56.40	65.90		$\chi^2(1) = .75$
<i>Parent Characteristics</i>				
<i>M</i> Age in Years (<i>SD</i>)	37.71 (8.38)	36.76 (6.06)	<i>t</i> (76) = .57	
<i>M</i> Mother Education Years (<i>SD</i>)	14.72 (3.10)	14.15 (2.67)	<i>t</i> (78) = .88	
% Married	82.10	68.30		$\chi^2(1) = 2.02$
% Family Income > \$50 k	46.20	61.00		$\chi^2(1) = 1.23$

**p* < .05.

measures and attending all sessions involved in the intervention. Participants were primarily recruited through the Inland Regional Center (IRC), a government agency that provides services for all individuals with DD. Families who met the study criteria were identified from the agency's computerized databases, screened by agency staff and mailed brochures about the study to prospective families.

Criteria for study entry were: (1) having a child ages 3 to 5 years old in order to target early developmental periods, (2) child had been previously determined to have a DD prior to the intervention, (3) parent(s) reported that their child exhibits more than 10 behavior problems (this is the recommended cutoff score for screening children for treatment of behavioral problems) on the Eyberg Child Behavior Inventory (ECBI; Robinson et al., 1980), (4) the primary caregiver was not participating any form of psychological or behavioral treatment at the time of referral and did not display any severe psychopathology, and (5) the primary caregiver agreed to participate in the intervention. Parents of children between the ages of 3 to 5 years with DD old were specifically chosen in order to intervene early in development, to potentially bypass negative long-term consequences that parenting stress may have on internalizing problems in such a vulnerable population. Parents were ineligible if their children had debilitating physical disabilities or visual or auditory impairments that prevented them from participating in the assessment tasks described in the protocol (e.g., child is not ambulatory, deaf, or blind).

Procedure

Interested parents contacted the study personnel by phone, returned postcard, or by submitting their information on the study's website. A phone screen was conducted with interested parents to assess for eligibility, and, if the family met eligibility for the study, an appointment was scheduled for the initial laboratory assessment at Loma Linda University. All primary caregivers were then mailed a packet of questionnaires including information about demographics, services, and their child's level of internalizing problems, which were completed prior to being randomly assigned to the immediate treatment or waitlist-control group.

Parents assigned to the immediate treatment group received an intervention, delivered by a certified MBSR instructor, that follows the MBSR manual outlined by Kabat-Zinn et al. (1992). The intervention contained three main features: (1) didactics that demonstrate the concept of mindfulness, the psychology and physiology of stress and anxiety, and every day instances in which mindfulness can be used as a more adaptive response to stress, (2) exercises focused on mindfulness during the group meetings and as homework between sessions, and (3) discussion and sharing in small and large groups. The

program included eight weekly 2-h sessions, a day-long meditation retreat, and daily home practice based on audio CDs with instruction.

Following the completion of the immediate treatment group, families who had completed the intervention were asked to complete a post-treatment assessment and six-month follow up assessment. Families were compensated for the assessments receiving 10 USD (pre-intervention), 15 USD (post-intervention), and 50 USD (follow-up a), resulting in total payments of 75. USD Families in the waitlist-control group were required to complete the baseline pre-intervention assessment at the same time as families in the immediate intervention group, as well as a second baseline assessment at the same time as the post-assessment for the immediate treatment group. After completing the second baseline assessment, families of the waitlist-control group then engaged in the MBSR intervention. These families received an additional 10 USD for completing an extra assessment prior to treatment. Although all families who participated in the intervention were asked to return for a six-month follow-up, for the purposes of the current study we only focused on pre- and post-measures data. See [Figure 1](#).

Measures

Demographic Data

Demographic data were collected during an interview with the participating parent (see [Table 1](#)).

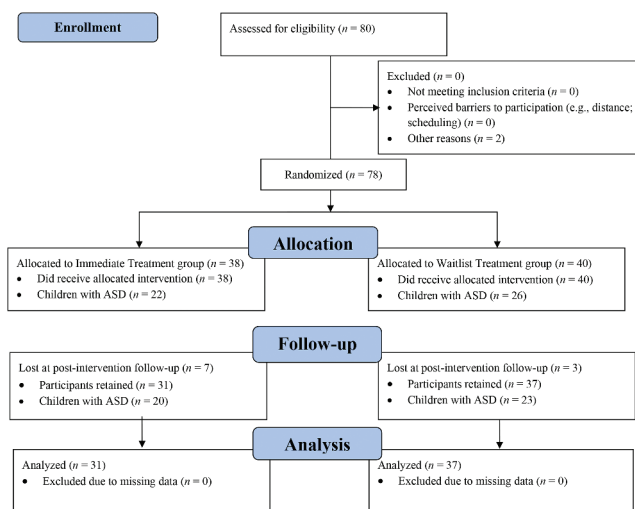


Figure 1. CONSORT flow diagram.

Table 2. Results of a hierarchical linear regression analysis with treatment group predicting child internalizing problems post-treatment.

	<i>b</i>	β	<i>t</i>	<i>p</i>	95% CI (<i>b</i>)	R^2_{adj}	pr^2	sr^2
Step 1						.48		
Baseline Int	.83*	.70	7.82	.00	[.62, 1.04]		.48	.48
Step 2						.51		
Baseline Int	.85*	.71	8.20	.00	[.64, 1.05]		.51	.50
Tx Group	-3.28*	-.19	-2.21	.03	[-6.24, -.32]		.07	.04
Step 3						.51		
Baseline Int	.83*	.70	8.00	.00	[.62, 1.03]		.50	.47
Tx Group	-3.33*	-.20	-2.26	.03	[-6.27, -.39]		.06	.04
ASD Status	2.10	.12	1.37	.17	[-.96, 5.153]		.03	.01
Step 4						.52		
Baseline Int	.80*	.67	7.61	.00	[.59, 1.01]		.48	.42
Tx Group	-5.71*	-.33	-2.36	.02	[-10.55, -.87]		.08	.04
ASD Status	.42	.02	.21	.84	[-3.66, 4.50]		.00	.00
TXxASD	3.82	.21	1.23	.22	[-2.36, 10.01]		.02	.01

Parents' baseline report of their child's internalizing problems is represented by Baseline Int; Treatment group (waitlist control vs immediate MBSR) is represented by Tx group; child's ASD diagnosis is represented by ASD Status; the interaction between the enrollment in MBSR treatment group and the child's ASD diagnosis is represented by TXxASD.

* $p < .05$

Child Behavior Checklist for Ages 1 ½ – 5 (CBCL, Achenbach, 2000)

Prior to the initial assessment, parents completed the CBCL 1 ½ to 5 to assess for child behavior problems. The CBCL contains 99 items that are scored as “not true” (0), “somewhat or sometimes true” (1), or “very true or often true” (2). Each item represents a problem behavior, such as “acts too young for age” and “cries a lot.” For the current study, we used the Internalizing Scale which includes the subscales of Emotionally Reactive, Anxious/Depressed, Somatic Complaints, and Withdrawn. T-scores greater than or equal to 64 were considered to fall within clinical ranges (Lande et al., 2009). Parental assessments of internalizing and externalizing behavior and executive function in children with primary hypertension. *The Journal of Pediatrics*, 154(2), 207–212.

The Bangor Mindful Parenting Scale (BMPS) (Jones et al., 2014)

The BMPS is a 15-item questionnaire used to measure mindfulness explicitly in how parents interact with their children. The BMPS is based on the Five Facets of Mindfulness Questionnaire (FFMQ), with three items representing each of the five underlying constructs encompassing mindfulness identified by Baer et al. (2006). This measure was used to assess parents' mastery of mindfulness skills over the course of the intervention and was completed at the first session, fifth session, and last session.

Table 3. Pre- and post-treatment child cbcl internalizing scores.

	<i>N</i>	Treatment		Waitlist	
		<i>M (SD)</i>	<i>N</i>	<i>M (SD)</i>	<i>M (SD)</i>
Pre-Treatment	38	65.71 (8.34)	40	65.75 (6.20)	
Post-Treatment	31	62.26 (10.74)	37	64.70 (6.07)	

Table 4. Hierarchical linear regression analysis examining changes in parents' mindful acting with awareness predicting internalizing problems post-treatment in MBSR group.

	<i>b</i>	β	<i>t</i>	<i>p</i>	95% CI (<i>b</i>)	R^2_{adj}	pr^2	sr^2
Step 1						.40		
Baseline Int	.96*	.72	3.92	.00	[.45, 1.48]		.46	.46
Baseline AA	.94	.17	.92	.37	[-1.21, 3.08]		.04	.02
Step 2						.48		
Baseline Int	.84*	.63	3.46	.00	[.33, 1.35]		.41	.32
Baseline AA	.33	.06	.32	.75	[-1.83, 2.49]		.01	.00
ASD Status	6.68	.31	1.77	.09	[-1.34, 15.28]		.16	.08
Step 3						.62		
Baseline Int	1.00*	.75	4.74	.00	[.55, 1.45]		.58	.42
Baseline AA	.91	.16	1.03	.32	[-.96, 2.76]		.06	.02
ASD Status	10.14*	.45	2.91	.01	[2.76, 17.53]		.35	.16
Post-Tx AA	-2.51*	-.45	-2.86	.01	[-4.38, -.65]		.34	.15
Step 4						.61		
Baseline Int	1.01*	.75	4.68	.00	[.55, 1.47]		.59	.43
Baseline AA	2.08	.38	1.04	.31	[-2.18, 6.35]		.06	.02
ASD Status	9.35*	.42	2.50	.03	[1.37, 17.33]		.29	.12
Post-Tx AA	-2.57*	-.46	-2.86	.01	[-4.49, -.65]		.35	.16
AAxASD	-1.40	-.22	-.66	.52	[-5.93, 3.13]		.03	.01

Parents' baseline report of their child's internalizing problems is represented by Baseline Int; parents' baseline levels of acting with awareness is represented by Baseline AA; child's ASD diagnosis is represented by ASD Status; parents' post-treatment levels of acting with awareness is represented by Post-Tx AA; the interaction between parents' post-treatment levels of acting with awareness and the child's ASD diagnosis is represented by AAxASD.

* $p < .05$.

Data Analytic Plan

Demographic variables were first correlated with both the independent variables and dependent variable. The demographic variables analyzed can be found in Table 1. No demographic variables were significantly correlated with both the independent variables and the dependent variables; thus, no demographic covariates were included in the models.

Prior to running main analyses, we tested for outliers, multicollinearity using VIF and Tolerance values, and checked the assumptions of regression. A multiple linear regression was run and DFBetas, Leverage, and Studentized Deleted Residuals were obtained to test for the leverage, discrepancy, and the influence of outliers. Multicollinearity was considered a concern if VIF values were greater than 10 and Tolerance values were less than .1. Multicollinearity concerns were present within our Aim 2 and Aim 3 analyses. VIF and Tolerance scores for the following analyses were outside of the aforementioned ranges: parents' baseline acting with awareness scores and child's ASD status and parents' baseline nonjudgment scores and child's ASD status. To address multicollinearity, we centered parents' baseline acting with awareness scores and parents' baseline nonjudgment scores to the mean. Additionally, we considered cases to be outliers if values for DFBetas, Leverage and Studentized Deleted Residuals were all outside the following ranges: DFBetas ± 1 , Leverage $< .48$, and Studentized Deleted Residuals ± 2.06 (Cohen et al., 2003). We found two outliers present

Table 5. Hierarchical linear regression analysis examining changes in parents’ mindful nonjudgment predicting internalizing problems post-treatment in MBSR group.

	<i>b</i>	β	<i>t</i>	<i>p</i>	95% CI (<i>b</i>)	R^2_{adj}	ΔR^2	Δsr^2
Step 1						.39		
Baseline Int	.90*	.71	3.74	.00	[.39, 1.42]		.45	.45
Baseline NJ	.90	.17	.87	.40	[-1.28, 3.08]		.04	.02
Step 2						.51		
Baseline Int	.75*	.59	3.27	.01	[.26, 1.23]		.40	.32
Baseline NJ	.16	.03	.16	.87	[-1.92, 2.25]		.00	.00
ASD Status	8.30*	.39	2.25	.04	[4.49, 16.10]		.24	.13
Step 3						.67		
Baseline Int	.68*	.54	3.60	.00	[.28, 1.08]		.46	.23
Baseline NJ	.19	.04	.24	.81	[-1.53, 1.92]		.00	.00
ASD Status	9.44*	.45	3.09	.01	[2.92, 15.96]		.38	.17
Post-Tx NJ	-2.06*	-.39	-2.93	.01	[-3.55, -.56]		.36	.15
Step 4						.68		
Baseline Int	.75*	.59	3.92	.00	[.34, 1.16]		.52	.26
Baseline NJ	1.83	.34	1.27	.23	[-1.27, 4.92]		.10	.03
ASD Status	8.66*	.40	3.92	.01	[2.15, 15.17]		.37	.14
Post-Tx NJ	-1.85*	-.35	-2.64	.02	[-3.35, -.35]		.33	.11
NJxASD	-2.22	-.33	-1.35	.19	[-5.76, 1.31]		.11	.04

Parents’ baseline report of their child’s internalizing problems is represented by Baseline Int; parents’ baseline levels of nonjudgment is represented by Baseline NJ; child’s ASD diagnosis is represented by ASD Status; parents’ post-treatment levels of nonjudgment is represented by Post-Tx NJ; the interaction between parents’ post-treatment levels of nonjudgment and the child’s ASD diagnosis is represented by NJxASD.

**p* < .05.

in our Aim 1 analysis and one for our Aim 3 analysis. However, removing two outliers did not significantly affect the results for either aim, thus were retained.

Aim 1

We used a hierarchical linear regression analysis to examine whether parents’ participation in the MBSR intervention predicted changes in internalizing problems in children with DD post-treatment. Baseline CBCL Internalizing T-scores were first entered in the first step of the regression, followed by treatment group status entered in the second step of the regression. Child’s ASD status was entered into the third step of the regression, and the interaction between treatment group and child’s ASD status was entered into the final step. By controlling for pre-treatment levels of each variable, we were able to examine how parents’ use of MSBR is related to their children’s internalizing problems.

Aims 2 and 3

To further investigate the specific mechanisms within MBSR that may impact child internalizing problems, we used two hierarchical linear regression analyses to examine whether changes in parents’ facets of mindfulness scores (acting with awareness or changes in parents’ mindful nonjudgment) would predict changes in internalizing problems in children with DD. First, baseline CBCL internalizing T-scores and parents’ baseline facets of mindfulness scores

were entered in the first step of the regression, followed by ASD status in the second step of the regression. Parents' post-treatment facets of mindfulness scores were entered into the third step and the interaction between ASD status and parents' post-treatment facets of mindfulness scores were entered into the final step of the regression. By controlling for pre-treatment levels of each variable, we were able to examine how parents' increases in specific facets of mindfulness were related to changes in children's internalizing problems.

RESULTS

Aim 1

Overall, parents' participation in an MBSR intervention accounted for a significant proportion of variance in levels of internalizing problems for both children with DD, $F(4, 62) = -5.71, p < .05$ (Table 2). The optimal linear combination of baseline level of internalizing problems, treatment group, child's ASD status, and the interaction between treatment group and child's ASD status accounted for approximately 51.70% of the variance in levels of internalizing problems in children with DD ($R^2_{\text{adj}} = .52$). Parents' participation in an MBSR intervention significantly predicted levels of internalizing problems in children with DD. Specifically, parents in the MBSR group reported scores 5.71 points lower on average on children's internalizing problems in comparison to parents in the waitlist-control group ($b = -5.71, 95\% \text{ CI } [-10.55, -.87], sr^2 = .04, p < .05$). Furthermore, we found that after parents participated MBSR, only 47% of children met clinical levels of internalizing problems, compared to roughly 68% who met clinical cutoffs at the baseline assessment. See Table 3 for means and standard deviations of pre- and post-treatment child internalizing CBCL scores for both the treatment and waitlist control groups. Child ASD status did not significantly predict levels of internalizing problems, $p > .05$. There was not a significant interaction effect between parents' participation in an MBSR intervention and the child's diagnosis on child's internalizing problems, $p > .05$.

Aim 2

Overall, parents' mindful acting with awareness accounted for a significant proportion of variance in levels of internalizing problems in children with DD $F(5, 15) = -2.57, p < .05$ (Table 4). The optimal linear combination of baseline level of internalizing problems, parents' baseline mindful acting with awareness, child's ASD status, parents' post-treatment mindful acting with awareness, the interaction between parents' post-treatment mindful acting with awareness, and child's ASD status accounted for approximately 61.20% of

the variance in levels of internalizing problems in children with DD ($R^2_{\text{adj}} = .61$). Changes in parents' mindful acting with awareness significantly predicted levels of internalizing problems in children with DD. Specifically, as parent's mindful acting with awareness increased by 1-point at post-treatment, children's internalizing problems decreased by 2.57-points at the mean of changes in parents' mindful acting with awareness levels and holding all other predictors constant ($b = -2.57$, 95% CI $[-4.49, -.65]$, $sr^2 = .16$, $p < .05$). Additionally, child's ASD status did significantly predict levels of internalizing problems $F(5, 15) = 9.35$, $p < .05$ (Table 4). The mean level of internalizing problems for children with ASD was 9.35 points higher than the mean level of internalizing problems for children without ASD. There was not a significant interaction effect between parents' mindful acting with awareness and the child's diagnosis on child internalizing problems, $p > .05$.

Aim 3

Overall, changes in parents' mindful nonjudgment accounted for a significant proportion of variance in internalizing problems in children with DD $F(5, 114) = -1.85$, $p < .05$ (Table 5). The optimal linear combination of baseline level of internalizing problems, parents' baseline parents' nonjudgment, child's ASD status, parents' parents' nonjudgment, the interaction between parents' post-treatment parents' nonjudgment, and child's ASD status parents' nonjudgment and their child's diagnosis accounted for approximately 68.30% of the variance in levels of internalizing problems in children with ASD ($R^2_{\text{adj}} = .68$). Changes in parents' mindful nonjudgment significantly predicted levels of internalizing problems in children with DD. Specifically, as parent's mindful nonjudgment increased by 1-point, post-treatment, children's internalizing problems decreased by 1.85-points at the mean of changes in parents' mindful nonjudgment levels and holding all other predictors constant ($b = -1.85$, 95% CI $[-3.35, -.35]$, $sr^2 = .11$, $p < .05$). Additionally, child's ASD status did significantly predict levels of internalizing problems $F(5, 15) = 8.67$, $p < .05$ (Table 5). However, there was not a significant interaction effect between changes in parents' mindful nonjudgment and the child's diagnosis on child internalizing problems, $p > .05$.

DISCUSSION

A growing body of literature has highlighted the impact of parental stress on the development of behavioral problems in children with DD (Chan & Neece, 2017; Neece, 2014; Singh et al., 2006) and that parents of children with DD who participated in MBSR reported less parenting stress (Bazzano et al., 2015; Beer et al., 2013; Neece, 2014) and fewer child behavior problems (Chan &

Neece, 2017; Neece, 2014). However, research on the relation between parenting stress, MBSR, and internalizing problems in children with DD, particularly children with ASD, has been limited. In the present study, we investigated the relation between parents' use of MBSR and internalizing problems in a sample of children with DD. Additionally, due to the prevalence of comorbid internalizing problems (De Ruiter et al., 2007; Matson et al., 2010; Mayes et al., 2011) and variation in symptomology (Kerns et al., 2015) in children with ASD in comparison to children without ASD, we investigated the aforementioned relations with child ASD status as a moderator.

The current study investigated the relation between parents' use of MBSR and internalizing problems in children with DD, with an emphasis on increases in the mindful facets of acting with awareness and nonjudgment. Parents who participated in MBSR reported significant reductions in their child's internalizing problems post-treatment compared with parents who had not participated in MBSR. However, ASD status was not found to be a significant moderator of the relation between parents' participation in MBSR and child internalizing problems. The fact that the relation between parents' use of MBSR and internalizing problems was not different between groups, indicates that MBSR parenting interventions may be generalizable in reducing internalizing problems across children various forms of DD, including children with ASD. This finding is particularly salient as previous research has shown that internalizing problems may manifest differently in children with ASD compared to children with various DD (Davis et al., 2010). Despite differences in symptomology, MBSR parenting interventions may address child internalizing problems regardless of diagnosis.

The relation between parents' use of mindfulness skills and reductions in internalizing problems for children with DD may be further explained by increases in specific facets of mindfulness such as acting with awareness and nonjudgment. We found that within the MBSR group, children of parents who had greater increases in acting with awareness and those who had greater increases in nonjudgment post-treatment, had greater reduction in internalizing problems post-treatment. However, neither of these findings were moderated by child's ASD status, such that increases in parents' ability to act with awareness and/or increases in parents nonjudgment may reduce internalizing problems in children DD, regardless of diagnosis.

Our findings are consistent with that of previous research on TD children, such that children of parents who act with awareness tend to report lower levels of internalizing problems as a result of parents being more aware of their child's needs (Duncan et al., 2009; Sluis et al., 2015) Similarly, TD children whose parents respond to them nonjudgmentally report reductions in internalizing problems such as anxiety and depression (Parent et al., 2016). Although, more research is necessary to further investigate this relation, it is possible that parents' use of acting with awareness and use of nonjudgment are

key components in the reduction of internalizing problems in children with DD. These findings highlight the need for additional research on how parents' use of aspects of mindfulness may impact internalizing problems in children with DD.

Additionally, we found that within the MBSR group child's ASD status significantly predicted post-treatment internalizing problems in our Aim 2 and Aim 3 models, such that children with ASD had greater levels of internalizing problems. This finding is consistent with the literature which highlights the high prevalence rates of comorbid internalizing problems, such as anxiety or depression, in children with ASD (De Ruiter et al., 2007; Mayes et al., 2011; Simonoff et al., 2008). As previous research has shown internalizing problems can have long-term detrimental effects in individuals with ASD (Gotlib et al., 1998; Hughes & Gullone, 2008) leading to poor mental and physical health outcomes (Essau et al., 2002; Woodward & Fergusson, 2001). These findings further emphasize the importance of addressing internalizing problems early on in such a vulnerable population.

Limitations and Future Directions

Although our findings are promising, these results are not without limitations, first, this study did not use an active treatment control group, and therefore, the findings only suggest that MBSR is more beneficial than no treatment at all. Future studies may benefit from comparing MBSR to other stress-reduction or psychoeducation groups as a control intervention. Additionally, although previous studies focusing on TD individuals have not found strong relations between the facets of observing, describing, and non-reactivity and reductions in internalizing problems (Brown et al., 2015; Bullis et al., 2014; Desrosiers et al., 2013), future studies focusing on ASD or DD populations may benefit from investigating these relations further.

Additionally, another limitation to this study was the lack of clarity in child diagnoses. Child's primary diagnosis was parent report at baseline, but the categories of diagnosis were not mutually exclusive. It is possible that families whose child had a primary diagnosis of another DD (e.g., Downs Syndrome) may have fallen on the autism spectrum as well. Furthermore, in addition to parent report of diagnosis, families were asked to complete the Gilliam Autism Rating Scale, Second Edition (GARS-2) to support ASD diagnoses within the context of the study; however, research has highlighted concerns with test sensitivity in regard to GARS-2 (Montgomery et al., 2008). Future studies may benefit from utilizing more sensitive measures in regard to ASD classification.

Furthermore, an additional limitation is that our findings relied entirely on parent-report data to measure both mindfulness facets and child internalizing problems. It is possible that reporting biases and parent perception may have influenced our findings. For instance, due to the highly comorbid nature of

ASD and internalizing problems (Vasa & Mazurek, 2015), it may be difficult for parents to decipher what symptoms are an aspect of ASD and what are indicators of internalizing problems. Moreover, higher levels of stress at baseline or lower levels of stress post-treatment may have also affected parents' reports of child internalizing problems. Future studies may benefit from utilizing additional reports of child internalizing problems, as well as observational measures. Additionally, it may be beneficial to look at more than two time points to further investigate how the intervention may benefit children with DD over time.

Conclusions

Despite these limitations, the implications of these results are important and help to further explain the relation between parents' use of MBSR and child internalizing problems and provide the groundwork for future longitudinal research. As research has shown, internalizing problems may continue throughout the lifetime and become more severe if left unidentified and untreated (Davis et al., 2008; Kendall, 1994; Spence et al., 2001). Therefore, improving parents' ability to act with awareness and interact nonjudgmentally with their children may play a key role in reducing internalizing problems in both children with ASD and DD in general early in development and bypass some of these negative long-term outcomes. This treatment offers a novel approach to treating comorbid internalizing problems in both children with ASD and DD in general. Parents' use of MBSR provides a method of early intervention which may impede the development of internalizing problems over time. The current study helps to inform future parenting interventions by highlighting the importance of addressing specific facets of mindfulness in interventions which may lead to greater reductions in internalizing problems in vulnerable populations such as children with DD.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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