CHAPTER FIVE

The effect of parent personality on the acquisition and use of mindfulness skills during an MBSR intervention

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Abstract

Mindfulness based stress reduction (MBSR) has been shown to reduce stress among parents of children with DD, who often experience higher levels of stress than parents of typically developing (TD) children. The current study examined how parent personality impacted parents' learning and acquisition of mindfulness skills. Participants included 50 parents who participated in a waitlist-control trial examining the efficacy of MBSR for parents of children with DD. Results showed that Openness predicted increases in the trajectory of use of mindfulness over the course of the MBSR intervention. Openness also predicted increases in specific facets of mindfulness (i.e. Observe and Non-reactivity), while Conscientiousness predicted increases in Acting with Awareness specifically, from pre to post intervention. This study highlighted

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Openness and Conscientiousness as important personality traits with regard to how parents of children with DD learn and acquire mindfulness skills. Clinical implications and future directions are discussed.

Research has shown that parents of children with developmental delay (DD) report higher levels of stress when compared to parents of typically developing (TD) children (Abbeduto, Weissman, & Short-Meyerson, 1999; Baker, Blacher, Crnic, & Edelbrock, 2002). This is important as increased levels of parenting stress has been associated with decreased parental physical health (Johnson, Frenn, Feetham, & Simpson, 2011), higher levels of parental depression (Feldman et al., 2007; Hastings, Daley, Burns, & Beck, 2006), poorer parent well-being (Gerstein, Crnic, Blacher, & Baker, 2009), as well as less effective parenting (Crnic, Gaze, & Hoffman, 2005). It has also been shown to be related to negative child outcomes such as greater levels of behavioral problems (Baker et al., 2003; Neece, Green, & Baker, 2012; Orsmond, Seltzer, Krauss, & Hong, 2003) and the development of internalizing problems and psychological disorders among children with DD (Baker et al., 2002; Baker, Neece, Fenning, Crnic, & Blacher, 2010). These findings underscore the importance of providing greater supports for this vulnerable population.

Mindfulness based stress reduction (MBSR) is an empirically supported stress-reduction intervention with over three decades of research highlighting its effectiveness in reducing stress and anxiety, as well as promoting overall well-being in a variety of populations (Grossman, Niemann, Schmidt, & Walach, 2004). MBSR typically includes formal mindful meditation instruction and practices to help integrate mindfulness into everyday life and to increase coping and decrease physiological and emotional reactivity (Bazzano et al., 2015). Previous studies have shown that parents and caregivers of children with DD who engage in MBSR exhibit reductions in parenting stress (Bazzano et al., 2015; Beer, Ward, & Moar, 2013; Neece, 2014), as well as increases in the five core facets of mindfulness (Roberts & Neece, 2015).

Mindfulness has been operationalized as containing five core facets which are used to assess the general propensity to be mindful in everyday life (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). According to Baer's model, mindfulness is a capacity to react non-judgmentally (taking a non-evaluative stance in regard to the inner experience), observe (noticing experiences), act with awareness (purposefully attending to moment-to-moment behaviors), describe (labeling experiences with words), and

respond non-reactively (in regard to the inner experience) (Baer et al., 2006; Cash & Whittingham, 2010). Research has shown that increases in these five facets have been linked to reductions in stress (Brown, Bravo, Roos, & Pearson, 2015; Bullis, Bøe, Asnaani, & Hofmann, 2014). Additionally, increases in these facets in parents have also been shown to be related to reductions of internalizing and externalizing problems in TD children (Han et al., 2019). These findings highlight the beneficial nature of the five facets of mindfulness for both parent stress, as well as child behavior problems. Although research has shown that engaging in MBSR is associated with an increase in these five facets (Carmody & Baer, 2008; Roberts & Neece, 2015), research on person-specific factors that may influence the use or tendency to engage in MBSR is scarce.

Given the positive benefits of mindfulness practice and the fact that increased use of mindfulness is associated with improved outcomes (de Vibe et al., 2015), it is important that we understand the individual differences that are associated with increased use. Research has shown that there is a relationship among various personality traits and mindfulness practice (Brown & Ryan, 2003; Feltman, Robinson, & Ode, 2009; Latzman & Masuda, 2013; van den Hurk et al., 2011). One of the most common conceptualizations of personality is from the Big Five Inventory (BFI; McCrae & Costa, 2013), which posits that personality encompasses five different traits including neuroticism, openness, conscientiousness, extraversion, and agreeableness. Across numerous studies, neuroticism has been shown to have a strong inverse relationship with the use of mindfulness (Latzman & Masuda, 2013; van den Hurk et al., 2011). Conversely, openness (Baer et al., 2006; Latzman & Masuda, 2013), agreeableness (Giluk, 2009), and extraversion have all been shown to be positively correlated with mindfulness practice (van den Hurk et al., 2011). The literature on the relationship between conscientiousness and mindfulness is not as clear and the results of various studies indicate mixed findings (Giluk, 2009; Latzman & Masuda, 2013; van den Hurk et al., 2011).

The relationship between each of these five personality traits and mindfulness practice has been examined cross-sectionally within several populations, but few studies have looked at the personality traits within the context of an MBSR intervention. A few studies have found neuroticism to be a moderator of treatment effects in an MBSR intervention (de Vibe et al., 2015; Jagielski et al., 2020; Nyklíček & Irrmischer, 2017). In each of these studies, participants who were high in neuroticism saw greater improvements in well-being following an MBSR intervention.

Researchers attributed this finding due to the fact that individuals who are high in neuroticism tend to report higher instances of negative mood and therefore have more to benefit from learning mindfulness techniques. Findings on conscientiousness were mixed across different samples. For medical and psychology students, greater conscientiousness was associated with greater decreases in stress following an MBSR intervention (de Vibe et al., 2015); while for women with cancer diagnoses, lower levels of conscientiousness was related to lower levels of distress after intervention (Jagielski et al., 2020). These differences in effects of conscientiousness on stress outcomes in various populations may be attributed to different types of stress and stressors present and how they relate to personality. Specifically, in a study including women with cancer diagnoses, women who were low in conscientiousness were more likely to experience distress so they had more to gain from the MBSR intervention (Jagielski et al., 2020). In a study with medical and psychology students, researchers posited that students high in conscientiousness were likely to have higher levels of stress related to graduate school and studying, and therefore had more variability to improve from (de Vibe et al., 2015). Given that parents of children with DD have high levels of stress that tend to be chronic across the lifespan (Miodrag & Hodapp, 2010), it is possible that the personality facets associated with parenting stress are different and may have a unique impact on how parents learn mindfulness.

Although these studies examine the relation between personality and MBSR intervention outcomes, they do not address how personality may affect the learning and use of mindfulness skills. A greater understanding of the personality factors that affect the learning and use of mindfulness may help to better inform which individuals may benefit the most from MBSR. One study by Barkan et al. (2016) looked at personality and learning of mindfulness in an MBSR intervention with a population of older adults. The authors found that openness predicted use of meditation techniques both during and following an MBSR intervention whereas agreeableness was more associated with the use of these techniques during the intervention. Despite the numerous studies that have examined outcomes associated with MBSR, very few studies have looked at how personality factors affect the learning of mindfulness (Barkan et al., 2016).

In addition to use of mindfulness skills, personality affects the degree to which an individual engages with the different facets of mindfulness (Spinhoven, Huijbers, Zheng, Ormel, & Speckens, 2017; van den Hurk et al., 2011). The Describe facet is important to many mindfulness

techniques and it involves developing an ability to identify and label inner and outer experiences (Baer et al., 2006). Research suggests that this skill may be linked to ability to attend to the present moment (Baer, Smith, & Allen, 2004) which would likely lead to better self-regulation (Shapiro, Carlson, Astin, & Freedman, 2006). Given these possible connections (van den Hurk et al., 2011), studies have found that the Describing facet is associated with openness (Spinhoven et al., 2017; van den Hurk et al., 2011), extraversion, and conscientiousness (van den Hurk et al., 2011). Openness to experience may also influence how willing participants are to engage in mindfulness activities and it has been linked to the observing facet of mindfulness (Spinhoven et al., 2017). Individuals who are more open are often labeled as curious and insightful (McCrae & Costa Jr., 2013) and therefore may be more likely to notice their surroundings and experiences. The facets of non-judgment, non-reactivity, and acceptance are also key aspects of mindfulness and have been linked inversely to neuroticism (Spinhoven et al., 2017; van den Hurk et al., 2011). Researchers suggest that the strong, negative relationship between neuroticism and these facets may be because each of these facets are related to self-regulatory skills that may be difficult for individuals who are high in neuroticism. Given the relationships among the personality traits and five facets of mindfulness, it is important to understand how we can best increase use of the five facets in individuals with varying personality profiles.

1. Current study

Research has shown that engaging in MBSR and continued use is associated with an increase in acting with awareness, responding non-judgmentally, non-reactivity, observing, and describing (Carmody & Baer, 2008; Roberts & Neece, 2015). Increased use of the five facets of mindfulness in parenting have been shown to be related to reductions in parenting stress and improvements in parent well-being (Corthorn, 2018). However, to our knowledge, no studies have looked at how parents learn mindfulness through MBSR and improve in the five facets of mindfulness or how factors such as personality may affect this process. Given the role of mindfulness practice in decreasing stress as the result of an MBSR intervention, it is important that we understand how differences in parents' personality may alter responsiveness to intervention. Personality may have a different relation with mindfulness based on types of stress typical in different populations (de Vibe et al., 2015; Jagielski et al., 2020), and it is possible that

personality affects parents of children with DD differently, as they typically experience high levels of stress that are chronic across the lifespan (Miodrag & Hodapp, 2010). The current study aimed to explore the relations between personality and both use of mindfulness and increases in the five facets of mindfulness over the course of an MBSR intervention. Specifically, we addressed the following aims: (1) To examine personality traits as predictors of changes in the frequency of parents' use of mindfulness over the course of the MBSR intervention, (2) to examine personality as a predictor of changes in specific facets of mindfulness over the course of the MBSR intervention. For Aim 1 we hypothesized that parents who had higher levels of extroversion, conscientiousness, agreeableness, and openness to experiences would predict increases in parents' use of mindfulness. We also hypothesized that parents with higher levels of neuroticism would predict decreases in parents' use of mindfulness. For Aim 2, we hypothesized that personality traits that are significantly related to individual facets of mindfulness will lead to significant changes in parents' use of mindfulness.

2. Method

This method for the Mindful Awareness for Parenting Stress (MAPS) study has been used in the following manuscripts (Chan & Neece, 2018; Neece, 2014; Roberts & Neece, 2015; Sanner & Neece, 2017).

2.1 Participants

In the current study, we used data from the MAPS study. Eligible participants included parents who had a child between 2.5 and 5 years of age who had been diagnosed with a DD, either by the Inland Regional Center or by independent assessment. Parents also had to report at least 10 child behavior problems on the Eyberg Child Behavior Inventory (Robinson, Eyberg, & Ross, 1980). Also, the parent could not be engaged in any form of psychological treatment at the time he or she was referred to participate in the study. Finally, children with extreme physical disabilities or intellectual impairments were excluded from the study, as this impaired their ability to participate in a parent-child interaction task that was part of the larger study.

For this study, we included data from 50 participants from the MAPS study. Most of the parents who participated were female (96%), many were married (76%), and the mean age was 37.11 years ($SD = 6.53$). Half of the parents identified as Hispanic (50%). Parents reported diverse family income

ranging from $0 to over $95,000 a year, with 36% of families earning less than $35,000 per year. There were varying levels of education attainment but 52% of parents did not receive formal education past a high school diploma or an equivalent degree. The children in these families were predominantly male (70%) with a mean age of 4.28 years ($SD = 0.97$). Autism Spectrum Disorder (62%) was the most common child diagnosis and the remaining children had various other developmental delays (38%). Additional demographic data are summarized in Table 1, and means and standard deviations of all study variables are included in Table 2.

2.2 Procedures

Procedures were approved by the Institutional Review Board at Loma Linda University. In the current study, we used data from a larger randomized control trial examining the efficacy of Mindfulness-Based Stress Reduction in reducing parenting stress and child behavior problems among families of children with DD (Chan & Neece, 2018; Neece, 2014). We recruited most of the participants through the Inland Regional Center, which is a government agency that provides services for individuals with DD; additional

Table 1 Characteristics of participants in MBSR intervention.

N = 50	*N*	%	*M* (*SD*)
Parent demographics			
Age			37.11 (6.53)
Gender (Female)	48	96	
Race (Hispanic)	25	50	
Married	38	76	
Family Income (<$35,000)	18	36	
Parent formal education			
≤ High school diploma/GED	26	52	
College or professional degree	24	48	
Child demographics			
Age			4.28 (0.97)
Gender (male)	35	70	
Diagnosis (ASD)	31	62	

Table 2 Means and standard deviations of personality and mindfulness variables.

Study variables	*M*	*SD*
BFI openness	3.31	0.66
BFI agreeableness	3.84	0.59
BFI neuroticism	2.69	0.76
BFI conscientiousness	3.57	0.65
BFI extraversion	3.34	0.87
SUDS (use of mindfulness) pre-Tx	3.19	3.11
SUDS (use of mindfulness) post-Tx	6.54	1.87
FFMQ observe pre-Tx	23.92	5.71
FFMQ non-judgment pre-Tx	23.00	7.13
FFMQ acting with awareness pre-Tx	23.20	6.46
FFMQ non-reactivity pre-Tx	19.19	4.21
FFMQ describe pre-Tx	26.47	6.59

Note. BFI, Big Five personality inventory; SUDS, subjective units of distress; FFMQ, five facets of mindfulness questionnaire; pre-Tx, pre-treatment; post-Tx, post-treatment.

recruitment was done through the local newspaper, local elementary schools, and community disability groups. To ensure that families met the specified eligibility criteria, research staff first did a phone screening with all parents who had contacted the MAPS Laboratory and expressed interest in participating in the study. Eligible families were then scheduled for a baseline assessment and received a packet in the mail containing measures for the study's outcome variables, along with instructions to complete the packet before their baseline assessment.

At the baseline assessment, parents turned in the completed packet of questionnaires. They then signed an informed consent and were interviewed by research staff to gather demographic data. After the interview, parents were randomly assigned to an immediate treatment or waitlist-control group. Although parents were informed that their participation in the mindfulness intervention could potentially reduce their stress, and that they were assigned to participate in this intervention either immediately or at a later time, parents were blind to the waitlist-control design of the study.

The MBSR intervention follows the manual outlined by Dr. Jon Kabat-Zinn (1990) at the University of Massachusetts Medical Center. The

intervention included a didactic component in which participants learned about the concept of mindfulness and stress physiology, a practice component in which group members practiced mindfulness techniques, and a group discussion component. The MBSR program included eight weekly two-hour sessions, a daylong six-hour meditation retreat after the sixth session, and daily home practice based on audio CDs with instructions. The MBSR group leader was informed that he needed to deliver MBSR as manualized and was blind to the waitlist-control design of the study. See Chan and Neece (2018); Neece (2014) for more details regarding the procedures for the MBSR intervention used in the study.

As part of the waitlist-control design, parents from both the immediate treatment and waitlist group returned for a second assessment, during which only the immediate treatment group had received MBSR, and parents completed the same questionnaire measures collected at the baseline assessment. After the second assessment, parents in the waitlist group received MBSR and returned to the MAPS laboratory for a post-treatment assessment. Six months following the end of the intervention for each respective group, parents from each group received a follow-up assessment. After the completion of the project (i.e., all assessments were conducted), parents received a short summary and comparison of their child's behavioral functioning over the course of the intervention in order to reinforce parents' efforts to improve their parenting skills as well as raise awareness of remaining concerns.

Treatment Fidelity. Two trained research assistants assessed treatment fidelity each session using a treatment fidelity checklist developed for this project, which quantifies the number of items completed as anticipated per the manualized MBSR protocol as well as contact time reported in minutes (see Roberts & Neece, 2015, for details). Interrater reliability was high with 95.04% agreement between the two raters. In the treatment group, 73.27% ($SD = 16.60$) of the treatment content items were covered, compared to 78.03% in the control group ($SD = 9.93$), $t\ (34) = 1.046$, $p > 0.05$. Average contact time for the treatment group was 143.40 ($SD = 74.68$) and 141.75 ($SD = 76.17$) minutes for the control group, which was not significantly different, $t(34) = 0.065$, $p > 0.05$.

2.3 Measures

Demographics. Demographic variables were collected during an interview with the parents during the baseline assessment.

Big Five Personality Inventory. Personality traits were measured using the Big Five Inventory, which is a well validated 44-item self-report measure (BFI; John & Srivastava, 1999). The BFI includes the following subscales measuring five personality traits: extroversion, neuroticism, agreeableness, openness, and conscientiousness. Extraversion reflects the frequency and quality of interpersonal contact, capacity for joy, activity level, and stimulation-seeking behavior. Conscientious persons are best described as dutiful, scrupulous, perseverant, punctual, and organized. Agreeable individuals are compassionate, good-natured, complying, and trusting. Emotional stability is the opposite of neuroticism. As such, emotionally stable individuals are calm, unemotional, and self-satisfied, whereas neurotic persons are often nervous, touchy, anxious, depressed, and insecure. Finally, openness comprises characteristics such as curiousness, versatility, creativity, and originality. Each item is measured on a five-point likert-like scale ranging from strongly disagree (1) to strongly agree (2). All of the five subscales had acceptable reliability. In our sample, the Cronbach's alphas for all the subscales ranged from 0.70 to 0.86.

Subjective Units of Distress Scale. The subjective units of distress scale (SUDs; Roberts & Neece, 2015). We used question seven from the SUDS which asked participants "How much did you use your mindfulness this week?" This item was adapted from a subjective measure of maternal use of mindfulness in parents, the Subjective Units of Mindfulness (Singh et al., 2007), and was scored on a likert scale ranging from No use at all (0) to Very frequent, almost constant use (10). Participants filled out the SUDs measure at nine different time points including each weekly MBSR session, and at the weekend retreat which was following the sixth MBSR session.

Five Facets of Mindfulness. The Five Facets of Mindfulness Questionnaire (FFMQ) is a 39-item self-report questionnaire used to measure parents' development of specific mindfulness attributes, which suggests the use of mindfulness intervention skills in daily life (Baer et al., 2006). Parents rate items on a five-point Likert scale ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*). The FFMQ contains five independent subscales: (1) Observe Scale, which measures an individual's sensory awareness or how the reporter sees, hears, and perceives the internal and external world (example item: "When I'm walking, I deliberately notice the sensations of my body moving"), (2) Describe Scale which measures how an individual labels experiences and expresses them to themselves and others (example item: "I'm good at finding words to describe my feelings"), (3) Act with Awareness Scale which measures how and if an individual chooses actions

based on a attunement to a present moment situation (example item: "When I do things, my mind wanders off and I'm easily distracted [reverse coded]"), (4) Non-judgment Scale measuring an individual's own self-acceptance and unconditional empathy (example item: "I criticize myself for having irrational or inappropriate emotions [reverse coded]"), and (5) Non-react Scale which refers to an individual's ability to actively detach from negative thoughts and emotions while accepting them and choosing not to react (example item: "I perceive my feelings and emotions without having to react to them"). We administered the FFMQ measure at the baseline, session five, and post treatment. Cronbach's alpha for the subscales in our sample ranged from 0.73 to 0.91 across sessions.

2.4 Data analytic plan

Prior to testing our models, demographic variables were correlated with both the IV and DV for Aims 1 and 2. The demographic variables analyzed were those that are listed in the demographic table below (Table 1). No demographic variables were found to significantly correlate with both the IV and the DV. Therefore, no demographic covariates were included in the models.

2.4.1 Aim 1

Given that our analyses were exploratory in nature, we ran correlation analyses to examine which personality factors were related to use of mindfulness at baseline and at the last session of the intervention. If a personality factor was significantly correlated with either baseline or the last session use of mindfulness, then that personality factor was examined as a predictor of changes in use of mindfulness over the course of an eight-week MBSR intervention.

Two-level multilevel modeling for longitudinal data was used to test the hypothesis that the use of mindfulness would increase over the course of an 8-week MBSR intervention (sessions one through eight and retreat after week six) and that specific parent personality traits significantly correlated at baseline or post-treatment would predict changes in use of mindfulness over the course of the nine sessions. Analyses were performed using HLM-7 software and full maximum likelihood estimation. We also checked our data for outliers and assumptions of multi-level modeling including linearity, normality, and homoscedasticity of errors, which are described in further detail in the results section.

As recommended by Singer and Willett (2003), we evaluated a series of increasingly complex models leading up to the hypothesized final model. First, we examined the unconditional means model (Model A). This model allowed us to calculate how much variance occurred separately at Level 1 and Level 2 but did not include any predictor variables at either level of the model. Second, we added Time as a fixed predictor at Level 1 (Model B). We then evaluated the unconditional growth model (Model C), which allowed Time to vary randomly at Level 1. In Model D, we added personality factors as predictors of the intercept at Level 2, and in the final model we added personality as predictors of the slope at Level 2. Changes in deviance statistics were used to evaluate model fit, where a statistically significant decrease in deviance scores between tested models indicated superior fit (Singer & Willett, 2003).

2.4.2 Aim 2 and 3

Bivariate correlations were run in order to determine which personality factors were related to specific facets of mindfulness, given that our aims were exploratory in nature. If a personality trait was significantly related to either baseline or post-treatment score for any facet of mindfulness, then they were included in subsequent regression analyses. If any two personality traits were related to the same facet of mindfulness, both personality traits were included in the hierarchical linear regression. However, if the personality traits were correlated at higher than $r = 0.6$, the personality trait with the highest correlation to the mindfulness facet was solely used in the analysis, which was based on a recommendation by Gujarati and Porter (2009) to omit variables apriori in order to address multicollinearity concerns. Prior to running our regression analyses, we also tested for outliers and assumptions of regression. For each analysis, we obtained DFBetas, Leverage, and Studentized Deleted Residuals and evaluated them to test for leverage, discrepancy and influence of outliers. Cases were considered outliers if values for DFBetas, Leverage, and Studentized Deleted Residuals were outside of the following ranges: DFBetas ± 1, Leverage >0.14, and Studentized Deleted Residuals ± 2.

For each personality trait that was significantly related to either baseline or post-treatment score for any facet of mindfulness, a hierarchical linear regression analysis was run with personality as the independent variable and post-treatment facet of mindfulness as the dependent variable, while controlling for baseline levels of the facet of mindfulness. Specifically, we added the baseline facet of mindfulness variable in block 1, personality facet in block 2, and post-treatment facet of mindfulness as the dependent

variable. By controlling for baseline levels of the facet of mindfulness, we were able to examine if personality predicts changes in the facets of mindfulness between baseline and the last session of the intervention. Hierarchical linear regressions were used, rather than HLM as in Aim 1, given that five facet data were collected at fewer time points than SUDS use of mindfulness.

3. Results

3.1 Specific aim 1

3.1.1 Preliminary analyses

Bivariate correlation analyses were run in order to determine the relations between parent personality and parent use of mindfulness at baseline. Both parent Extroversion ($r = -0.31$) and parent Openness ($r = -0.34$) were significantly correlated with parent use of mindfulness at baseline ($ps < 0.05$). Given that these were the only personality traits related to use of mindfulness, parent Extroversion and parent Openness were the only personality traits included in subsequent longitudinal analysis for Specific Aim 1. Bivariate correlations for personality traits and SUDS use of mindfulness were included in Table 3.

For each model, we examined the data for outliers and for violations of the assumptions of multilevel modeling including linearity, normality, and homoscedasticity of errors. We evaluated the data in the unconditional means model and the final model for outliers and assumptions of multilevel

Table 3 Bivariate correlations among of the Big Five personality traits and use of mindfulness during an MBSR intervention.

	1	2	3	4	5	6	7
1. BFI E	–						
2. BFI O	0.43[a]	–					
3. BFI C	0.32[a]	0.34[a]	–				
4. BFI A	0.24	0.34[a]	0.63[a]	–			
5. BFI N	0.02	−0.18	−0.40[a]	−0.52[a]	–		
6. SUDS Pre-Tx	−0.31	−0.34[a]	−0.18	−0.22	0.08	–	
7. SUDS Post-Tx	−0.11	0.16	0.14	0.05	−0.06	0.05	–

[a] $p < 0.05$.

Note. BFI, Big Five personality inventory; BFI E, BFI extroversion; BFI O, BFI openness; BFI C, BFI conscientiousness; BFI A, BFI agreeableness; BFI N, BFI neuroticism; SUDS, subjective units of distress (use of mindfulneess); pre-Tx, pre-treatment; post-Tx, post-treatment.

modeling including homoscedasticity of errors, linearity, and normality. No outliers found or violations of assumptions of multilevel modeling were found.

3.1.2 Primary results

Two level multi-level modeling for longitudinal data was used to assess changes in use of mindfulness over the course of an MBSR intervention, and the effect of personality on changes in use of mindfulness. Results are presented in Table 3. The results of the unconditional means model were used to calculate the interclass correlation coefficient, which indicated that 24% of the variance in use of mindfulness was at Level 2 (individual level). Time was included as a fixed variable in the next model (Model B), and demonstrated superior fit to the unconditional means model. The unconditional growth model (Model C) was tested next, and demonstrated superior fit to Model B ($p < 0.05$). Adding Openness as a predictor of the intercept of use of mindfulness did not significantly improve model fit ($p > 0.5$), and was removed as a predictor of the intercept. Extraversion was then added as a predictor of the intercept, but also did not improve model fit, and was removed from the model ($p > 0.05$). However, allowing Openness to predict the slope at level 2 (Model D) fit the model best, as evidenced by the statistically significant decrease in the Deviance statistic ($p < 0.05$). Allowing Extroversion to predict the slope at level 2 did not improve model fit and was removed from the model ($p > 0.05$).

The average use of mindfulness at baseline for participants was 4.46 ($SD = 0.27$, $p < 0.001$). For the slope, parent use of mindfulness increased by 0.32 points per session for parents at the mean of Openness. For every one point increase in Openness, parent use of mindfulness increased by 0.11. Allowing parent use of mindfulness to vary across sessions accounted for 28% of the variance at Level 1, and allowing parent Openness to predict the rate of change in parent use of mindfulness at Level 2 accounted for 20% of the variance in the rate of change. Results for the multi-level model were included in Table 4.

3.2 Specific aim 2

3.2.1 Preliminary analyses

Bivariate correlations were used to examine the relations between parent personality traits (extroversion, agreeableness, openness, neuroticism, and conscientiousness) and the five facets of mindfulness (FFMQ; observe, describe, act with awareness, non-judgment, and non-reactivity) at baseline

Table 4 Results of fitting multilevel models for change in frequency of use of mindfulness over the course of an MBSR intervention.

		A	B	C	D (Openness)
		Est. (SE)	**Est. (SE)**	**Est. (SE)**	**Est. (SE)**
Initial status	Intercept	5.69[a] (0.20)	4.45[a] (0.27)	4.46[a] (0.27)	4.46[a] (0.27)
	Openness				
Rate of change	Intercept		0.32[a] (0.05)	0.32[a] (0.05)	0.32[a] (0.05)
	Openness				0.11[b] (0.04)
Variance components					
Level 1:	Within person	4.65	0.18	0.28	0.28
Level 2:	In initial status	1.43	−0.08	−0.60	−0.60
	In rate of change (slope)			0.05	0.20
Fit	Deviance	1645.20	1581.62	1573.70	1569.84

[a] $p < 0.001$.
[b] $p < 0.01$.

and post-treatment. Parent Openness was significantly related to FFMQ Observe at post-treatment ($r = 0.55$), $p < 0.05$. Parent Extroversion was significantly correlated with FFMQ Describe at baseline ($r = 0.31$) and post-treatment ($r = 0.42$), and Agreeableness was related to FFMQ Describe at post-treatment ($r = 0.33$), $ps < 0.05$. Parent Openness was significantly correlated with FFMQ Non-reactivity at post-treatment ($r = 0.42$), $ps < 0.05$. Parent Agreeableness ($r = 0.32$) and parent Conscientiousness ($r = 0.35$) were both related to FFMQ Acting with Awareness at post-treatment, $ps < 0.05$. Given that Agreeableness and Conscientiousness were intercorrelated at higher than 0.6 ($r = 0.63$), only Conscientiousness was used in the subsequent hierarchical linear regression due to concerns for multicollinearity. Conscientiousness was chosen due to being more highly correlated to FFMQ Acting with Awareness than Agreeableness. This rule was applied across all models for all aims, and no other predictors included in the same model were intercorrelated at >0.60. Bivariate correlations between personality traits and the five facets of mindfulness at pre and post-treatment are included in Table 5.

Table 5 Correlations among the Big Five personality traits and five facets of mindfulness.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. BFI E	–														
2. BFI O	0.43[a]	–													
3. BFI C	0.32[a]	0.34[a]	–												
4. BFI A	0.24	0.34[a]	0.63[a]	–											
5. BFI N	0.02	−0.18	−0.40[a]	−0.52[a]	–										
6. OB Pre	−0.11	0.16	0.00	−0.15	0.09	–									
7. OB Post	0.16	0.55[a]	0.15	0.22	−0.04	0.40[a]	–								
8. DS Pre	0.31[a]	−0.01	0.00	−0.00	0.02	0.26[a]	0.24	–							
9. DS Post	0.42[a]	0.25	0.10	0.33[a]	−0.08	0.03	0.42[a]	0.64[a]	–						
10. AA Pre	−0.12	−0.11	0.15	−0.04	−0.14	−0.06	−0.18	0.31[a]	−0.07	–					
11. AA Post	0.01	0.11	0.35[a]	0.32[a]	−0.11	−0.05	0.21	0.16	0.28[a]	0.52[a]	–				
12. NJ Pre	−0.03	−0.08	0.02	0.04	−0.11	−0.14	−0.17	0.38[a]	0.14	0.65[a]	0.26	–			
13. NJ Post	0.13	0.14	0.11	0.20	−0.11	−0.03	0.18	0.31[a]	0.46[a]	0.29[a]	0.48[a]	0.61[a]	–		
14. NR Pre	0.02	0.16	0.00	−0.11	−0.15	0.42[a]	0.17	0.35[a]	0.16	0.15	0.01	0.12	0.08	–	
15. NR Post	−0.02	0.42[a]	0.13	0.14	−0.08	0.24	0.66[a]	0.16	0.32[a]	−0.19	0.16	−0.12	0.18	0.49[a]	–

[a] $p < 0.05$.

Note. BFI, Big Five personality inventory; BFI E, BFI extroversion; BFI O, BFI openness; BFI C, BFI conscientiousness; BFI A, BFI agreeableness; BFI N, BFI neuroticism; pre/post, pre-treatment/post-treatment; OB, Observe; DS, describe; AA, acting with awareness; NJ, non-judgment; NR, non-reactivity.

In order to evaluate for outliers, DfBetas, Leverage, and Studentized Deleted Residuals were saved and evaluated for each of the four regression analyses. For the analysis with parent Openness predicting changes in Observe, two outliers were found based on studentized residual scores >0.14 and by examining the residual plot using studentized deleted residuals. Two participants were deleted from this analysis. No other outliers or additional violations of the assumptions of regression were found in any of the other hierarchical linear regression analyses.

3.2.2 Primary analyses

In order to examine if personality traits predicted changes in five facets of mindfulness between baseline and post-treatment of the intervention, we ran four hierarchical linear regression analyses. Parent Openness significantly predicted FFMQ Observe, such that as parent Openness increased by one point, Observe increased by 3.50 ($p < 0.05$, $sr^2 = 0.25$). Conscientiousness significantly predicted FFMQ Acting with Awareness $p < 0.05$. Specifically, as parent Conscientiousness increased by one point, parent FFMQ Acting with Awareness increased by 2.21 points, 95% CI = [0.01, 4.4], $sr^2 = 0.08$, $p < 0.05$. Parent Openness significantly predicted FFMQ Non-reactivity, such that as Openness increased by 1, FFMQ Non-reactivity increased by 2.40, ($p < 0.05$, $sr^2 = 0.18$). Neither parent Extroversion or Agreeableness significantly predicted FFMQ Describe, $p > 0.05$. Results of the hierarchical linear regression analyses are presented in Tables 6–9.

Table 6 Hierarchical linear regression predicting week 8 observe from openness.

	ΔR^2	β	*b* (*SE*)	95% CI	sr^2
Step 1	0.215[a]				
Baseline OB		0.464	0.442 (0.133)	[0.173, 0.712]	0.215
Step 2	0.246[a]				
Baseline OB		0.333	0.317 (0.116)	[0.083, 0.551]	0.103
Openness		0.513	3.50 (0.828)	[1.825, 5.175]	0.246

[a] $p < 0.01$.
Note. Openness, openness subscale on BFI; OB, Observe on the FFMQ.

Table 7 Hierarchical linear regression predicting week 8 acting with awareness from conscientiousness.

	ΔR^2	β	*b* (*SE*)	95% CI	sr^2
Step 1	0.172[a]				
Baseline AA		0.415	0.332 (0.133)	[0.105, 0.560]	0.172
Step 2	0.075[b]				
Baseline AA		0.363	0.291 (0.111)	[0.067, 0.514]	0.127
Conscientiousness		0.280	2.21 (1.088)	[0.008, 4.401]	0.075

[a]$p < 0.01$.
[b]$p < 0.05$.
Note. Conscientiousness, conscientiousness subscale on BFI; AA, acting with awareness on the FFMQ.

Table 8 Hierarchical linear regression predicting week 8 non-reactivity from openness.

	ΔR^2	β	*b* (*SE*)	95% CI	sr^2
Step 1	0.109[a]				
Baseline NR		0.330	0.426 (0.188)	[0.047, 0.806]	0.109
Step 2	0.150[a]				
Baseline NR		0.287	0.371 (0.175)	[0.018, 0.723]	0.081
Openness		0.389	2.537 (0.881)	[0.757, 4.316]	0.150

[a]$p < 0.05$.
Note. Openness, Openness subscale on BFI; NR, Non-reactivity subscale on the FFMQ.

Table 9 Hierarchical linear regression predicting week 8 describe from extroversion and agreeableness.

	ΔR^2	β	*b* (*SE*)	95% CI	sr^2
Step 1	0.221[a]				
Baseline DS		0.470	0.523 (0.152)	[0.217, 0.829]	0.221
Step 2	0.127[b]				
Baseline DS		0.383	0.427 (0.151)	[0.121, 0.732]	0.130
Extroversion		0.215	1.290 (0.868)	[−0.464, 3.045]	0.036
Agreeableness		0.231	2.150 (1.268)	[−0.413, 4.712]	0.047

[a]$p < 0.01$.
[b]$p < 0.05$.
Note. Extroversion, Extroversion subscale on BFI; Agreeableness, Agreeableness subscale on BFI; DS, Describe subscale on the FFMQ.

4. Discussion

Research has shown that parents of children with DD who participate in MBSR interventions have significant reductions in stress post intervention (Neece, 2014). However, there is very little research on individual factors that impact how parents learn mindfulness skills over the course or the intervention and how often they utilize these skills. Given the high rates of stress evident in parents of children with DD (Baker et al., 2002), a better understanding of individual level factors that may impact who learns mindfulness will help to tailor future interventions. The current study was exploratory in nature given the dearth of literature on the relationship between personality and mindfulness in parents of children with DD, and highlighted personality as an important factor in how parents use mindfulness and acquire mindfulness facets over time. Specifically, for Aim 1 we found that both Extraversion and Openness were related to use of mindfulness at baseline, but that Openness was the only personality trait that predicted increases in use of mindfulness over the course of the intervention. For Aim 2, we found that Openness predicted increases in both Observe and Nonreactivity facets from baseline to post-treatment. Additionally, we found that Conscientiousness predicted increases in Acting with Awareness from baseline to post-treatment.

Our first aim addressed how personality impacts the trajectory of use of mindfulness over the course of an MBSR intervention. Parents' report of mindfulness use did significantly increase over the course of the intervention, which is consistent with previous research regarding MBSR interventions in various samples (de Vibe et al., 2015; Roberts & Neece, 2015). While parent Extroversion and Openness were both related to use of mindfulness at baseline, Openness was the only personality trait related to the trajectory of changes in parent's use of mindfulness. Individuals high in the openness trait are often more curious and creative, and may be more open to trying new skills (Barrick, Mount, & Judge, 2001). Some research has suggested that openness may be a particularly salient personality trait for MBSR (Latzman & Masuda, 2013), given that MBSR teaches skills and a way of thinking that is very unique and novel for most individuals. MBSR introduces a variety of skills over the course of the intervention, and it is possible that parents who are more open will continue to be willing to attempt new skills, which will add to their repertoire of mindfulness activities and increase use of mindfulness over the course of the intervention.

Openness is potentially an especially important trait for parents in the current study, given that many families likely participated due to interest in stress reduction and strategies to reduce child behavior, and may have been less informed regarding mindfulness. It is also possible that parents involved in the study are inherently more open to experiences given that the sample is treatment seeking. Regarding extroversion, it is possible that parents seeking a group intervention may also be inherently more extroverted, which may be why extroversion predicts use of mindfulness at baseline. However, given that mindfulness tends to be a more personal, introspective practice (Chambers, Gullone, & Allen, 2009), extroversion may have less to do with the trajectory of how parents learn mindfulness or how their use of mindfulness increases over time. Given that use of mindfulness increased over time, we would also predict that parent's specific facets of mindfulness would increase over the course of the intervention.

For Aim 2, we examined the relations between personality traits (Extroversion, Openness, Neuroticism, Conscientiousness, and Agreeableness) and changes in the five facets of mindfulness (Observe, Describe, Non-judgment, Non-reactivity, and Acting with Awareness) over the course of an MBSR intervention. Research has shown that specific facets of mindfulness increase over the course of an MBSR intervention for parents of children with DD (Roberts & Neece, 2015), but to our knowledge, there is no research addressing individual factors that impact increases in these facets. Specifically, we found that Conscientiousness and Openness were important predictors of changes in several of the five facets of mindfulness.

While findings regarding conscientiousness are mixed in the mindfulness literature (de Vibe et al., 2015; Jagielski et al., 2020), we found that increases in parent Conscientiousness significantly predicted increases in Acting with Awareness from pre to post MBSR intervention. Children with DD often display increased behavioral concerns (Baker et al., 2003; Neece et al., 2012) and are often much less independent throughout their lives in comparison to their TD peers (Kao, Kramer, Liljenquist, Tian, & Coster, 2012). As a result, parents of children with DD have to be diligent and often hypervigilant in the everyday care of their child, including advocating for services and participating in behavioral therapies for their child. Additionally, in order to respond appropriately to child needs and behavioral concerns, parents need to be aware of their child's needs and act accordingly. Individuals with high levels of conscientiousness are typically highly responsible, dependable, and rule-following (Barrick et al., 2001), which may make managing the needs

of a child with DD more accessible. Given this, conscientiousness is likely a salient personality trait for parents of children with DD, and acting with awareness may be an especially important facet for parents of children with DD. When managing challenging behaviors, additional factors such as observing and non-reactivity may also be especially salient facets of mindfulness for parents of children with DD, given that more harsh or negative parenting behaviors occur when parents are more reactive (Niehaus, Chaplin, Turpyn, & Gonçalves, 2019).

Consistent with prior mindfulness research, we found that parent Openness was related to increases in mindful facets (Spinhoven et al., 2017; van den Hurk et al., 2011). Specifically, increased parent Openness predicted increases in both the Non-reactivity and Observe facets. Given that our study found that Openness predicted increases in use of mindfulness over the course of the study, it makes sense that Openness would also be related to increases in specific facets of mindfulness. Often higher levels of stress are associated with individuals reacting emotionally (stress reaction) to difficult situations, rather than being aware and choosing how to respond (stress response; Kabat-Zinn, 1990). For parents, this could mean reacting emotionally to negative child behavior without observing and paying attention to the function of a child's behaviors. In evidenced-based behavioral treatments, parents are taught that to eradicate negative child behavior, you first have to understand what is reinforcing the behavior (Webster-Stratton, 2001). Observing is likely a very important facet for parents of children with DD, as parents high in observing may be more able to be more actively aware of what their children are doing and respond in a way that is less reactive. Given that emotional reactivity in parenting is associated with more harsh or maladaptive parenting strategies (Niehaus et al., 2019), this facet is likely a very salient facet for parents of children with DD. As previously discussed, individuals high in openness tend to be more willing to engage in new activities (Barrick et al., 2001). Having higher levels of openness may help parents to be more willing to engage in new, mindful ways of thinking, thus improving facets such as observing and non-reactivity that may be salient for parenting a child with DD.

While literature consistently links neuroticism to stress outcomes from MBSR (Jagielski et al., 2020; Spinhoven et al., 2017; van den Hurk et al., 2011), less research has examined if neuroticism is related to changes in parents' use of mindfulness. For parents of children with DD, their high level of stress is chronic, beginning in the early years of the child's life and often increasing over the course of their child's life (Miodrag & Hodapp,

2010). Parents may learn to cope with their stress, but the stressor itself is stable. Neuroticism as a personality trait is often highly correlated with stress (Lahey, 2009). Thus, it is possible that given the chronic and stable nature of this parenting stress in the context of parenting a child with DD, parent neuroticism is less salient in how it affects how parents learn mindfulness or acquire any of the five facets of mindfulness.

4.1 Limitations

These results must be considered within the context of several study limitations. First and foremost, the current study utilized only self-report measures, which may be subject to bias. Future studies may benefit from utilizing more standardized measures of assessing personality such as the Minnesota Multiphasic Personality Inventory Second Edition (MMPI-2; Graham, 1993), which is not as subject to personal biases. Regarding measures of mindfulness, future studies may benefit from utilizing daily diaries which allow parents to track their daily mindfulness use, as well as observational measures, and corroborating reports from friends or family members.

Regarding statistical limitations, one possible limitation in the current study is our relatively small sample size in relation to the number of analyses run. Given that we ran four hierarchical linear regressions, as well as a multilevel model, there is a possibility of increased Type 2 error. Additionally, given the relatively high correlation between the Conscientiousness and Agreeableness trait ($r = 0.63$), we chose to only include Conscientiousness as a predictor of Acting with Awareness in order to address potential multicollinearity. While removing Agreeableness does address multicollinearity concerns apriori, it is possible that there is some model specification bias as a result (Gujarati & Porter, 2009).

Another possible limitation to the current study is that we recruited primary caregivers of children with DD and our sample primarily consisted of female parents (96%). While it is common to have primarily mothers participate in parenting interventions, it is possible that we may have potentially missed certain gender effects on our findings. Some studies have found that different personality traits such as neuroticism and conscientiousness were more common in females than males and that there were differential effects of some personality on stress outcomes following MBSR for females versus males (de Vibe et al., 2015). Given these findings, it is possible that there are also different effects of gender when considering how a parent learns mindfulness. Future research may benefit from recruiting parents of various

genders to better understand if there are gender differences in how certain personality traits relate to the use of mindfulness.

Lastly, while we did measure use of mindfulness weekly, at nine time points over the course of the MBSR intervention, which is a potential strength of the study, we only looked at five facets of data at baseline and post-MBSR treatment. Measuring changes in five facets at an increased number of time points across the intervention would allow us to track non-linear changes in the five facets, as well as within-person changes over time, which is a limitation of the current study. It is also possible that personality traits may impact continued use and retention of mindfulness skills and facets of mindfulness following the intervention, and future studies may benefit by utilizing follow-up data. However, despite these limitations we still believe that our findings are important for future studies targeting this vulnerable population.

4.2 Clinical implications and future directions

Overall, our results highlight openness and conscientiousness as particularly salient personality traits for parents of children with DD learning mindfulness in the context of an MBSR intervention. Specifically, our findings show that increases in parents' Openness predicts increased use of mindfulness, and more Openness and Conscientiousness lead to increases in individual facets of mindfulness including Observing, Non-reactivity, and Acting with Awareness. Knowing that Openness may contribute to how much parents increase in their use of mindfulness, as well as increases in Observing and Non-reactivity may help to inform clinical interventions. Clinically, if we know that an individual is lower in openness, they may be less willing to try new and novel mindfulness skills. Implementing interventions such as Motivational Interviewing prior to MBSR, which has been shown to improve commitment and motivation to change behaviors (Miller & Rollnick, 2013), may also improve parent's openness and willingness to engage in novel experiences. This increase in openness may also improve parent outcomes in intervention. Further, for clinicians, a greater understanding of client personality traits that may contribute to improvements in treatment may help to inform interventions, and prepare clinicians to adapt treatments in order to better serve clients.

Given the high rates of stress in parents of children with DD (Abbeduto et al., 1999; Baker et al., 2002), a greater understanding of individual factors that may contribute to reductions in stress outcomes in this vulnerable

population is crucial. The current study highlighted Openness and Conscientiousness as important personality traits for the learning of mindfulness for parents of children with DD, which may help to inform future intervention research. By identifying personality factors that may impact participation in future interventions, researchers and clinicians can anticipate who may benefit from MBSR and provide appropriate support to those who may be less likely to engage.

Conflict of interest

The authors declare that they have no conflict of interest.

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