PATHWAYS TO PARENTING STRESS AND CHALLENGING BEHAVIORS FOR PRESCHOOLERS WITH DEVELOPMENTAL DELAYS: THE ROLE OF EMOTION REGULATION

by

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DISSERTATION ABSTRACT

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Title: Pathways to Parenting Stress and Challenging Behaviors for Preschoolers with Developmental Delays: The role of emotion regulation

Background: Parents play a significant role in shaping children's behaviors and their responses to emotions. Research has established a strong, bi-directional effect between parenting stress and children's challenging behaviors. Research also suggests the ways in which parents respond to their own emotions to accomplish goals, termed emotion regulation (ER), may affect the same process in their children. This role is especially pronounced during the preschool period, and among children identified with developmental delay (DD). However, research has yet to clarify how both parent and child ER shape the relationship between parenting stress and children's challenging behavior. This study aimed to explore the extent to which parent and child ER explain the pathway between parenting stress and children's challenging behavior, among culturally diverse families of children with DD.

Methods: Baseline data from 265 families enrolled in a larger intervention study were used for this project. Multi-modal measurement methods (parent-report and observation) were used to measure ER for parents and children. Confirmatory Factor Analysis indicated distinct constructs for different measurement modalities of ER, and thus, were tested separately in models. Structural Equation Modeling was utilized to test

parenting stress as a moderator of the relationship between parent and child ER, and child ER and parenting stress as mediators of the relationship between parent ER and child behaviors.

Results: Partial support was given to initial hypotheses, such that parenting stress moderated the relationship between parent and child ER only for observational data. The original mediation hypotheses were unsupported, however, exploratory models indicated child ER as a partial mediator to the relationship between parenting stress and children's challenging behaviors. Confirmatory Factor Analyses supported a two-factor structure of parent emotion dysregulation for observational data.

Conclusions: The results of this study entail implications for both intervention and future research. Interventions which focus on either parenting stress or child ER may prevent the development of behavioral challenges in children with DD. Future research must work to clarify the interaction between parent ER and parenting stress, as well as from a developmental perspective, investigate how child ER mediates the relationship between parenting stress and children's challenging behaviors.

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TABLE OF CONTENTS

LIST OF FIGURES

Figure Page

LIST OF TABLES

Table Page

I. INTRODUCTION

Parenting is an inherently emotional experience. Raising a child can bring about a range of emotions – from feelings of joy and accomplishment during a baby's first steps, to feelings of frustration and worry as a teenager yearns for independence. The dynamic nature of emotions serves as an adaptive process within the evolutionary role of parents to nurture offspring, allowing for flexible and timely responses to a child's needs. Emotional experiences within parent-child dyads are often interwoven, with ample research establishing that child affective displays impact parental affect (Martin et al., 2002), as well as parenting behaviors (Rueger et al., 2011). Specifically, shared positive affect between parents and their infants and children are critical components of positive developmental outcomes, such as the development of self-regulation (Feldman et al., 1999), cognitive and social competencies (Feldman, 2007), academic competence (Harrist et al., 1994), and as a protective factor against the development of later psychopathology (Lunkenheimer et al., 2011; Martin et al., 2011).

In terms of parenting behaviors, meta-analytic research demonstrates a relationship between parental positive affect and supportive parenting, whereas negative affect is more related to harsh or coercive parenting styles (Rueger et al., 2011). This aligns with established transactional models of development contesting that the flexible nature of emotions within the parenting context can serve as an advantage when they are effective in igniting behaviors that align with parental goals for the self and child (Dix, 1991). For example, worry is likely adaptive when a child goes into the road chasing a ball, and a parent quickly tells their child to stop or come back. Dix (1991) posits that emotions can serve a more maladaptive role within the parenting context when they lead to behaviors incompatible with promoting desired outcomes, and thus, lead to a pattern of sustained negative affect. Take a parent who is worried their child

will become frustrated with independent tasks, and so they help their child get dressed and ready for school daily. This worry, while serving to temporarily avoid negative affect for the child, likely interferes with the parent's goal for their child to develop an independent morning routine, and long-term, leads to feelings of frustration or hopelessness. While a degree of negative affect certainly serves an adaptive role in parenting, studies show sustained negative affect within parent-child interactions is associated with overall affective inflexibility (Hollenstein & Lewis, 2006). This accumulated research suggests that parent emotions are most effective when they evoke child behavior aligned with parental goals, and when negatively valanced, are effective in driving behaviors that shift the dyad back to a shared, positive state.

Parenting Stress

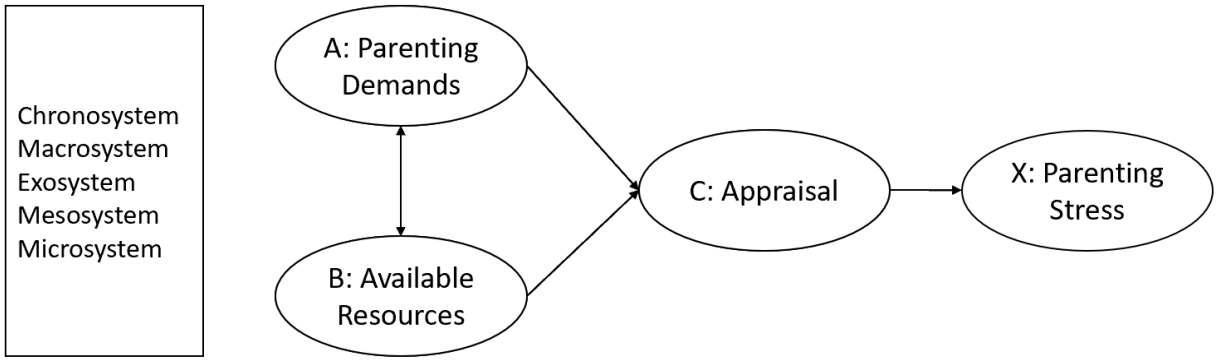
Prolonged negative emotional states within the parent-child dyad are often associated with the experience of parenting stress (Williford et al., 2007). Parenting stress includes emotional, physiological, and cognitive responses to stressors associated with parenting (Deater-Deckard, 1998). Parenting stress is considered a normative process within the parenting role, and distinct from other domains of interpersonal stress. Importantly, parenting stress occurs on a spectrum and is a multifaceted process, encompassing demands associated with parenting, child and parental mental well-being, as well as the parent-child relationship (Abidin, 1997; Crnic & Greenberg, 1990; Deater-Deckard, 1998). Generally, stress, can serve an adaptive function in small doses, spurring action-oriented behaviors that are beneficial to the parent and child (Calabrese, 2008; Schilling et al., 2013). However, at high levels, parenting stress predicts maladaptive outcomes for both parents and children, leading to patterns of ineffective parenting behaviors (in-terms of evoking desired child behaviors), and increased risk for child and parent psychopathology (Eyberg et al., 1993; Jackson & Huang, 2000; Rollè et al., 2017).

ABC-X: A 3 factor model of Parenting Stress

Parenting stress often stems from a mismatch between the resources a parent has at hand and the contextual demands of parenting and is influenced by the parent's appraisal of this mismatch. This pattern forms the basis of the ABC-X Model of Family Stress (McCubbin & Patterson, 1983), wherein A is the stressor, or accumulated demands of the parenting role, B is available resources, C is the appraisal of the stressor, and X is the interaction of the 3, which may culminate in parenting stress (Rosino, 2016; Figure 1).

Figure 1

Conceptual Diagram of the ABC-X Model of Parenting Stress (McCubbin & Patterson, 1983). The box on the left represents the ecological systems (Bronfenbrenner, 1979) which are likely to influence ABC factors.



Embedding the ABC-X model within an ecological systems framework (Bronfenbrenner, 1979), each component may be influenced by multiple systems. Contextual demands of parenting (A) may entail sociocultural expectations of the parenting role, family dynamics, and the individual needs of a child. Available resources (B) include personal resources such as parental wellbeing, access to community resources like quality education systems and medical care, and social and familial support. Appraisal (C) is both determined by parents' individual

differences in cognitive processing styles, as well as prior experiences with general life stress (Plant & Sanders, 2007a). In support of this model, Östberg and Hagekull (2000) found heightened demands (e.g., child caretaking hassles, more children), depleted resources (e.g., high workload, low social support), and appraisals (perception of child as difficult, negative life events) all predicted parent stress.

Parenting Stress and Raising a Child with a Developmental Delay

Accordingly, some families may be more at risk for parenting stress due to the heightened demands of parenting or gaps in available resources. Both risk factors are often present for caregivers of children with developmental delay (DD). Studies consistently show that parents of children with DD are prone to experience higher levels of stress than parents caring for children with other physical or mental health needs (Barroso et al., 2018; Hayes & Watson, 2013; Schieve et al., 2007). Barriers to obtaining timely access to services certainly play a role in this stress (Bourke-Taylor et al., 2012), with 25% of caregivers of children with Autism Spectrum Disorder (ASD), reporting unmet service needs (Benevides et al., 2016), often citing long waiting lists, eligibility and referral difficulties, and unavailability of trained providers (Lim et al., 2020; Vohra et al., 2014). These barriers are exacerbated for non-White and non-English speaking parents (Lim et al., 2020), parents in poverty (Liptak et al., 2008), parents without private medical insurance (Zuckerman, Chavez, et al., 2017), and parents in rural areas (Murphy & Ruble, 2012). Parents of children with DD often also assume an expanded parenting role in terms of coordinating their child's services and navigating shifts to family life (DePape & Lindsay, 2015). Post-diagnosis, parents find themselves wearing many new "hats", such as the role of the therapist, case coordinator, and advocate (DePape & Lindsay, 2015).

Parents identify many positive aspects to raising a child with DD, including strengthening family bonds, encouraging personal growth, expanding social connections, and feelings of pride and joy in their relationship (Rafferty et al., 2020; Taunt & Hastings, 2002). The identification of these positive aspects is likely influenced by a parent's appraisal of meeting the demands of their parenting role. Indeed, studies show feelings of parental empowerment and positive re-appraisals of caregiving responsibilities are linked to lower levels of stress and depression symptoms (Bourke-Taylor et al., 2012; Plant & Sanders, 2007a; Woodman et al., 2015).

Parenting Stress and Child Challenging Behaviors

Within the parent-child dyad, research has established a strong transactional relationship between parenting stress and children's challenging behaviors (Neece et al., 2012; Woodman et al., 2015) for children with DD. For the present study, child challenging behaviors will refer to both internalizing, and externalizing behaviors (Achenbach et al., 2016), which are the broad conceptual categories into which children's challenging behaviors fall. Internalizing behaviors describe child dysregulation that is focused inwards, such as anxiety, depression, and withdrawal, whereas externalizing behaviors describe dysregulation focused outwards, like aggression, impulsivity, and disruption.

Children with DD are at a higher risk for both externalizing and internalizing symptomatology compared to those without (B. L. Baker et al., 2010). Studies have found for individuals with DD, including intellectual disability (ID) and ASD, the incidence of comorbid mental health disorders ranges from 20-50% (Einfeld et al., 2011; M. A. Feldman et al., 2000; Vasa et al., 2013). Given the prevalence for mental health disorders in the general population is 13.4% (Polanczyk et al., 2015), children with DD are at an elevated risk for developing comorbid mental health conditions. This elevated risk begins as early as the pre-school age

period, with children with DD up to 3 times more likely to have clinically elevated externalizing and internalizing symptoms (B. L. Baker et al., 2003).

Longitudinal research has established that the relationship between externalizing behaviors and parenting stress is bi-directional in nature (B. L. Baker et al., 2003; Lin et al., 2021; Neece et al., 2012). Alternatively, internalizing behaviors tend to be better predicted by parenting stress, than vice-versa (G. Rodriguez et al., 2019; Woodman et al., 2015). These relationships are persistent when controlling for developmental level and symptom severity for ASD, showing these transactional relationships are not simply a product of developmental or social delays (B. L. Baker et al., 2003; Lin et al., 2021). Furthermore, meta-analytic research establishes parenting stress has a stronger relationship with externalizing behaviors (r = 0.57), than with internalizing behaviors (r = 0.37; Barroso et al., 2018). Taken together, parenting stress has a unique relationship with different types of challenging behaviors, showing a strong bi-directional relationship with externalizing behaviors, and a unidirectional effect of parenting stress towards the development of internalizing behaviors.

The relationships between parent stress and child internalizing and externalizing behavior are moderated by factors such as child age and parent gender (mother versus father), such that these patterns shift with respect to the child's age, and the parent's gender. In a study focused on the toddler years, researchers found parent driven effects for externalizing behaviors, and found a lack of bi-directional effects for internalizing behaviors (Lin et al., 2021). Across early development (pre-school age), research shows more bi-directional effects (B. L. Baker et al., 2003; Woodman et al., 2015; Zaidman-Zait et al., 2014) for both internalizing and externalizing behaviors. During middle childhood there is mixed evidence for directionality of effects (G. Rodriguez et al., 2019; Woodman et al., 2015), although a general trend emerges supporting

child-driven effects for externalizing behaviors, and parent-driven effects for internalizing-behaviors. During the adolescent period, research shows a trend towards parent-driven effects (Woodman et al., 2015). With fathers, parenting stress shows greater stability across time and consistency in terms of its bi-directional nature with child behaviors as compared to mothers (B. L. Baker et al., 2003; Gerstein et al., 2009; Neece et al., 2012).

Emotion Regulation

Another underlying mechanism that may influence both parent stress and child challenging behavior is emotion regulation (ER). Specifically, emotion dysregulation, or patterns of maladaptive responses to regulate emotions (Cole et al., 2019), underlies the development of externalizing and internalizing behaviors in children with and without DD (Cole & Hall, 2008; Conner et al., 2020; Korbut et al., 2020). ER can be defined as the automatic or controlled modulation of emotion towards adaptive, goal-directed behavior (Thompson, 1994). ER consists both of an activated emotion, and the regulatory response associated with that activated emotion (Cole et al., 2004). Regulatory responses often serve to alter the intensity, variability, or duration or an emotional response, related to its relevance to individual goals within an environmental context (Thompson, 2011). Thus, ER is not determined by emotion valence (i.e., positive to negative) alone, but the degree to which regulatory responses result in emotion modulation that assists or interferes with goal-directed behavior (Cole et al., 2004).

For example, with a child who gets their toy taken away and begins to cry, it is not the crying alone that signals a lack of ER, but the degree to which the sadness impairs their goal to play with toys. Sadness can serve as a signal that something we care about appears out of reach, and can help coordinate effort, and elicit support from others. Thereby, a child who is crying, but finds other toys to play with, versus a child who is crying and gives up on playing with toys,

could be said to have a greater ER skills. Another child may cry and elicit his mother's attention, and then engage with the toys after gaining comfort from his mother. Similarly, this child's responses successfully regulated his emotions to engage in goal-directed behavior.

Emotion Regulation versus Emotion Dysregulation

Emotion dysregulation should be distinguished from ER not as the inverse, or lack of ER, but patterns of dysfunctional responses to regulate emotions in relation to environmental context and personal goals. Cole et al. (2019) defined these dysfunctional responses as 1) interfering with achieving either short- or long-term goals, 2) violating developmental expectations for appropriate behavior, and 3) violating sociocultural standards for emotion-related expression and behavior. If the child's attempt to regulate his sadness to get a desired toy is shoving or biting his friend, for example, he will accomplish the goal of playing with a desired toy but will likely disrupt his friendship.

The Development of Emotion Regulation

While often thought of as an internal process, ER can be accomplished both through internal (self-regulation) or external (co-regulation) means (Cibralic et al., 2019). In the stolen toy example, the child who independently regulates their emotions and finds other toys engaged in self-regulation, while the child who went to his mother engaged in co-regulation. Additionally, ER can be derived through more passive means, shaping responses to environmental stimuli, or active means, actively shaping the environment. A child who withdraws from playing with his friend may be said to passively regulate his emotion, while the child who finds another toy to play with, may be said to actively regulate his sadness.

During the pre-school period, children progress from dependence on parental co-regulation to self-regulatory strategies and expand their co-regulatory strategies to involve other adults and peers (Skinner & Zimmer-Gembeck, 2007). Developmentally, children also shift from more passive to more active strategies. Passive strategies would entail reflexive responses to the environment, such as looking away or self-soothing, while active strategies would entail responses to change or interact with the environment, such as making a request for help or problem-solving. These developmental changes in ER are in part due to the rapid development of cognitive, social, and communicative processes across the preschool years (Harrington et al., 2020). Development in executive functioning occurs at the greatest rate during the preschool age period and is associated with significant structural shifts within the prefrontal cortex in the brain (Carlson et al., 2013; Zelazo & Carlson, 2012). Development of self-concept, and communication abilities additionally allow children to understand the impact they have on their environment and communicate requests that result in environmental changes (Reyes et al., 2020). While the preschool period is defined by greater use of active and self-regulatory strategies, and expansion past parents as sole co-regulatory agents, parents continue to have a direct and meaningful influence on the development and deployment of ER strategies.

Development of Emotion Regulation in Developmental Delay

For children with DD, parents may be particularly influential towards the development of child ER. During the preschool age, while most children have a developmental shift towards self-regulatory strategies, children with DD have demonstrated delayed ER development, with greater dependence on parental co-regulation strategies during this age (Nuske et al., 2017). Studies have found children with DD are also more likely to engage in passive ER strategies, such as avoidance and tantrums (Gulsrud et al., 2010; Hirschler-Guttenberg et al., 2015;

Mazefsky et al., 2013). Additionally, while children with ASD employ ER strategies at the same rate and with similar variability to children without ASD, they utilize strategies that are more passive, involve familiar rather than unfamiliar adults, and rely on others for comfort, rather than self-comfort (Nuske et al., 2017). Taken together, it appears parents have a prolonged role in the development of ER for children with DD.

The Role of Parents in Emotion Regulation Development

In line with the idea that parents are more influential towards the development of ER for children with DD, Norona and Baker, (2014) found maternal scaffolding, or supporting their child's involvement in a task, had a strong, bidirectional relationship with children's emotion dysregulation in preschool, but not during early school-age years (5-8 years old). Additionally, this relationship did not exist for children without DD. As a transactional process, children's ER patterns may also have effects on parents' behaviors. Parents of children with DD tend to engage in a wide range of strategies to assist with co-regulation (Gulsrud et al., 2010; Shenaar-Golan et al., 2017) and specifically may use simpler strategies in times of distress, such as physical comfort, rather than verbal explanations (Gulsrud et al., 2010). Therefore, it appears parents tend to adapt their strategies to be sensitive to children's developmental needs.

While parents appear to engage in sensitive co-regulatory behaviors, they are also likely to judge the success of their efforts on the degree to which they result in positive affective states. However, research shows for children with ASD, child-parent dyads are generally more likely to engage in mismatched affective states – with children more often displaying negative affect (Guo et al., 2017). During co-regulatory attempts, research also shows children with ASD show muted enjoyment and greater withdrawal from parents (Hirschler-Guttenberg et al., 2015). Finally, certain child regulatory strategies, such as tantrums, and greater use of passive ER strategies, are

related to lower family quality of life (Nuske et al., 2018), a construct which highly overlaps with parenting stress. Taken together, children's ER development may have an impact on parenting stress, particularly for parent-child dyads where there is a stronger reliance on parents for ER, and negative affective feedback from the child. Indeed, Kerns et al., (2017) found ineffective ER strategies, or utilizing a wider range of ER strategies without shifts in personal affect, during a child distress episode mediated the relationship between maternal and child anxiety and predicted use of accommodation behaviors, which are hypothesized to exacerbate children's anxiety symptoms. Therefore, a parent's own patterns of emotional dysregulation may also predict the degree to which they deploy effective co-regulatory strategies.

Parent Emotion Regulation and Child Emotion Regulation

The tripartite model of ER development (Morris et al., 2007) contends that parents influence the development of children's ER through parenting practices, modeling of ER strategies, and general emotion socialization practices within the family context. Initial research has demonstrated the role of parent ER in deployment of each of these three processes. For example, maternal emotion dysregulation predicts both supportive and suppressive emotional socialization practices, which in turn, predicts child dysregulation (Are & Shaffer, 2016; Li et al., 2019; Morelen et al., 2016). Research has also shown that in addition to encouragement of child ER, maternal ER predicts parenting practices such as limit setting, and aspects of the parent-child relationship, such as collaborative problem-solving (Shaffer & Obradović, 2017). This pattern remains consistent for children with DD, with parent's knowledge of emotions predicting their responses to children's emotions (Mazzone & Nader-Grosbois, 2016), and the parent-child relationship predicting children's ER (Hirschler-Guttenberg et al., 2015).

The relationship between parent and child ER is well-established in the general population literature (Are & Shaffer, 2016; Crespo et al., 2017). However, much is still being uncovered in this area, specifically with regard to research examining contributions of parent ER towards the development of child ER and child challenging behaviors (Zimmer-Gembeck et al., 2021). Importantly, studies have shown that parent ER may explain the pathway between parent stress and parenting practices (Carreras et al., 2019; Hu et al., 2019), as well as the relationship between maternal and child psychopathology (Ip et al., 2021; Kerns et al., 2017). The effects of parent ER are relatively robust in explaining the relationship between maternal and child internalizing symptoms, with studies showing limited access to ER strategies, suppression of own emotional responses, limited emotional awareness, and ER "cycling" (using a wide range of strategies without experiencing a change in affect), best account for the relationship between maternal and child internalizing symptoms (Crespo et al., 2017; Ip et al., 2021; Kerns et al., 2017). Thus, facilitating adaptive parent ER may serve as a protective factor against the development of challenging behavior.

The Role of ER in Pathways to Child Challenging Behavior

A recent meta-analysis shows a moderate relationship between parent ER and child ER, with pooled estimates of $r = 0.21$ ($k = 10$; Zimmer-Gembeck et al., 2021). Similar relationships exist between parent dysregulation and children's internalizing behaviors ($r = 0.22$; $k = 14$) and externalizing behaviors ($r = 0.18$; $k = 12$). This meta-analysis found heterogeneity in effect sizes across studies, in that age moderated this effect for internalizing, but not externalizing disorders. Specifically, studies with pre-school age samples, showed a larger effect for the relationship between parent dysregulation and internalizing behaviors ($r = 0.39$), than did studies conducted during middle childhood and adolescent years ($r = 0.22$).

Research also suggests the relationship between parent dysregulation and child ER likely play a role in pathways to internalizing and externalizing behaviors. For example, in a large sample of young children, children's emotion dysregulation mediated the relationship between maternal emotion dysregulation, and both child internalizing and externalizing behaviors (Crespo et al., 2017). Notably, scores that captured children's emotion dysregulation mediated this pathway, while adaptive child ER strategies did not, demonstrating the importance of delineating these constructs. Some studies have also examined specific domains of maternal ER, finding limited access to ER strategies, difficulties achieving goal-directed behaviors, difficulties controlling impulses, low observed ratio of positive to negative verbalizations within a dyadic interaction, serve to influence externalizing behaviors both directly, and indirectly, through their influence on child ER (Quetsch et al., 2018).

As child ER mediates the relationship between parent and child psychopathology (Suveg et al., 2011), as well as parent dysregulation and child challenging behaviors (Zimmer-Gembeck et al., 2021), ER may be a relevant construct to explain inter-generational transmission of psychopathology (Buckholdt et al., 2014). Indeed, parental responses to child challenging behavior often rely on modulation of emotions or emotional responses. For example, when a child throws a tantrum in the grocery store aisle, most parents are likely to feel negative emotions such as fear, frustration, and/or embarrassment. Similarly, when a child exhibits fear towards a doctor's appointment, many parents may feel fear, frustration, and/or embarrassment. To avoid reinforcing the child's challenging behavior, whether externalizing or internalizing, parents must both deploy effective ER strategies to manage their own negative emotions, as well as deploy effective parenting practices to encourage their child to engage in adaptive behavior.

Current Intervention Approaches: Behavior Parent Training

Distilling the dynamic between parenting stress, ER, and children's challenging behavior has direct implications for interventions designed to alleviate family distress. Behavioral Parent Training (BPT), also called parent management training (PMT), is one such intervention approach. BPT aims to reduce children's challenging behavior through teaching parents effective behavior management practices (Skotarczak & Lee, 2015). Within the general population, BPT is also effective in decreasing parenting stress (Colalillo & Johnston, 2016). For children with DD, BPT has established evidence for reducing behavior problems (pooled $g = 0.39$; Skotarczak & Lee, 2015), however shows inconsistent evidence for reducing parenting stress (Kostulski et al., 2021; Petrenko, 2013; C. L. Tellegen & Sanders, 2014). Similar to studies within a general population, parents of children with DD show increased feelings of competence in parenting, satisfaction in their role as a parent, and positive feelings towards their child, following BPT intervention (McIntyre, 2008; Plant & Sanders, 2007b; C. L. Tellegen & Sanders, 2014). Within an ABC-X framework, these findings suggest BPT may be effective in increasing positive appraisals, and potentially altering demands of parenting through lowered problem behaviors, though, not enough to meaningfully reduce parenting stress.

Initial studies of BPT focused on child challenging behaviors and parent stress as core intervention targets. However, more recent studies have explored the role of parent and child ER within the context of BPT. Specifically, research has shown increases in children's ER and decreases in emotion dysregulation following BPT across a range of developmental stages (Chang et al., 2003; Fosco & Grych, 2013; Lieneman et al., 2020; Rothenberg et al., 2019). Children's increases in ER have been shown to mediate treatment outcomes or the degree to which BPT results in decreases in challenging behavior (Mason et al., 2016). Similarly, parent rates of dysregulation have been shown to decrease over the course of BPT (Lieneman et al.,

2020; Zimmer-Gembeck et al., 2019). Parent ER may also moderate BPT efficacy, such that higher initial dysregulation diminishes the degree to which BPT results in decreased challenging child behaviors (Zachary et al., 2019). While preliminary research has established the importance of parent and child ER towards reducing challenging behaviors within the context of intervention, these findings have yet to be extended within a DD population.

Cultural Considerations in Parenting Stress and Emotion Regulation

Culturally and linguistically diverse parents (e.g., non-White, non-English-Speaking), have largely been left out of research investigating parental influences on emotion regulation. However, cultural context often plays a critical role in emotion regulation processes – establishing contextual appropriateness of ER strategies, as well as co-regulation that encourages culturally appropriate emotion regulation responses (Dunbar et al., 2016; De Leersnyder et al., 2013). For example, certain emotion co-regulation features, such as caregivers' use of cognitive appraisal, have been linked to decreased anxiety symptoms in Latinx children (Quiñones-Camacho & Davis, 2022). This relationship only held true for children with higher levels of cognitive flexibility, emphasizing the appropriateness of co-regulatory strategies are still dependent on fit with developmental level. Similarly, for Hispanic adolescents, researchers found adolescents' use of appraisal to be a protective factor against depression symptoms (Young et al., 2022). Cognitive reappraisal is a specific ER strategy that involves the suppression of negative emotions. The cultural value of "simpatía" within Hispanic/Latinx communities involves an emphasis on social expression of positive emotions over expression of negative emotions (Acevedo et al., 2020). Taken together, this research indicates cognitive appraisal as one example of a culturally relevant strategy, that is potentially transmitted intergenerationally through co-regulatory practices.

ER may hold additional relevance for families who experience persistent stress due to systematic discrimination related to ethnicity or a child's disability status (e.g., ableism and racism). Studies have found disparities in access to treatment for Latinx children with DD (Lopez et al., 2020), which may heighten parental stress throughout the diagnosis process (Zuckerman, et al., 2017). However, parents' ER abilities have been shown to mitigate the effects of stress both within the parenting context (Deater-Deckard et al., 2016; X. Hu et al., 2019), and context of broader sociocultural stressors, such as racial discrimination (Hatzenbuehler et al., 2009). Importantly, parents' ER abilities have been shown to moderate the degree to which stressors impact co-regulatory practices, such that higher ER buffers, or negates the impact of stressors on emotional reactivity within parent-child interactions (Deater-Deckard et al., 2016). Due to the differential impact of cultural context on the deployment and relevance of ER to daily stressors, priority is warranted towards research on parent ER and parenting stress in culturally and linguistically diverse samples, particularly with the goal of expanding equitable access to care.

Current Research Gaps

Ample research has established a transactional relationship between parenting stress and child challenging behaviors. More recent research has demonstrated the influence of parent ER on child ER development, and the stronger influence of parents in the development and deployment of ER strategies in children with DD. Research has also suggested parent ER may influence both parenting stress and children's challenging behaviors. However, the degree to which parent ER shapes relationships between parent stress, child ER, and challenging behavior remains largely understudied for families of children with DD, particularly across diverse samples.

The Current Study

The current study aims to extend the literature examining family and systematic influences on the intergenerational transmission of ER to families of children with DD with diverse cultural and linguistic backgrounds. Due to families' heightened risk for stress due to systemic factors, as well as children's developmental differences, parental ER could serve as an especially influential factor towards 1) reducing parental stress, 2) promoting the development of child ER, and 3) reducing challenging behaviors. This study aimed to explore the extent to which parent and child ER explain the well-established pathway between parenting stress and challenging behaviors for preschoolers with DD (Figure 2; Figure 3). Furthermore, with parent and child ER as emerging transdiagnostic features of children's social emotional development, and the parent-child relationship, this study also aimed to establish a novel measurement system for parent and child ER, using observational measurement.

More specifically, the following hypotheses were tested –

1) Parent dysregulation, as measured by the observational coding scheme, will have a one factor structure, which represents emotion dysregulation in parenting.
2) Child dysregulation, as measured by the observational coding scheme, may have a one or two factor structure, with respect to dysregulated behaviors falling within internalizing and externalizing dimensions.
3) Parent stress will moderate the relationship between parent ER and child ER.
4) Parent stress will mediate the relationship between parent ER and child challenging behavior.
5) Child ER will mediate the relationship between parent ER and child challenging behavior.

Figure 2

Conceptual model for research hypothesis 1, which positions parent stress as a moderator of the relationship between parent ER and child ER.

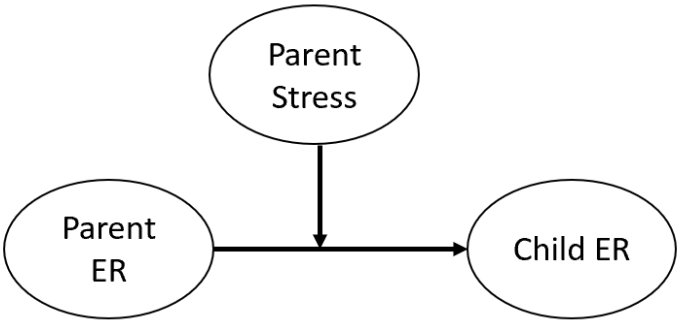
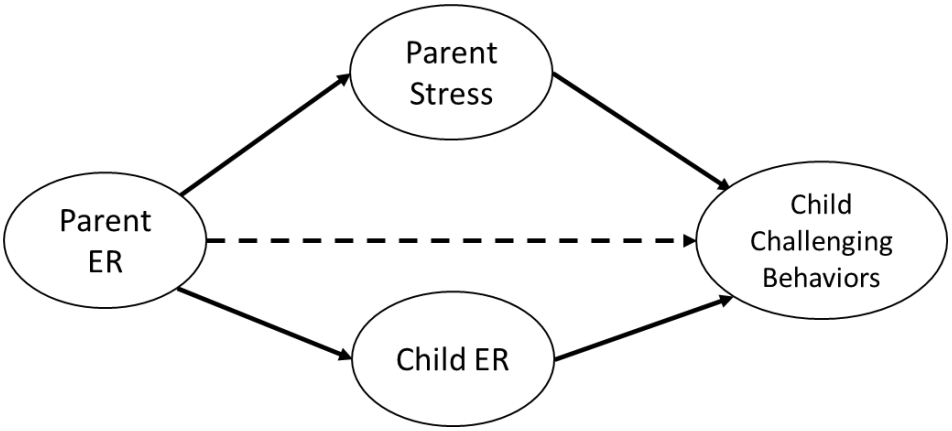


Figure 3

Conceptual Model for research hypotheses 2 and 3. The dotted line indicates a direct path – mediation tests if an indirect path (e.g., parent ER to challenging behaviors through parent stress and/or child ER) better accounts for this effect.



II. METHODS

Data for this study were collected as part of the baseline assessment of the PRO-Parenting Study (R01HD093661; PIs: McIntyre & Neece), a multi-site, randomized control, comparative efficacy study examining the efficacy of Mindfulness Based Stress Reduction (MBSR; Kabat-Zinn et al., 1985; Neece, 2014) when combined with BPT, specifically the Incredible Years adapted for children with developmental delay (IY-DD; McIntyre, 2008).

Participants

Participants included 265 preschool children with DD and their parents. Families were recruited from early intervention providers and early childhood education centers in California and Oregon. Families were enrolled in the study across seven separate cohorts from November 2017 – January 2022. Families were eligible for this study if 1) their child was 3-5 years old, 2) identified with a DD, as confirmed by early childhood special education eligibility, 3) parents experienced heightened parenting stress, as defined by scores at or above the 85th percentile on the Parenting Stress Index, Short Form, 4th edition, and indicated 4) elevated child-behavior problems, as indicated by a T-score of 65 or above on the Child Behavior Checklist (CBCL). Parents who were fluent in Spanish or English were invited to participate in this study, with study protocols for recruitment, assessment, and intervention offered in both Spanish and English. As data were collected as part of a larger treatment study, families currently receiving psychological or behavioral treatment were excluded. Parents with severe mental health conditions were also excluded from study participation and referred to low-cost community treatment options. Given the study's inclusion criteria, families were likely motivated to participate in the study to learn more about managing their children's challenging behaviors and generally about parenting a child with DD.

Demographics

Demographic information for the study sample is summarized in Table 1. Overall, families represented a range of linguistic and racial backgrounds. Most families' income was between $24,053 – $84,461, with around 27% of the sample falling under the poverty line according to US guidelines on household size and income (US Dept HHS, 2022). Most parents (79%) had at least a high school education. Around a third of parents (30%) were college educated. Parent survey respondents were majority female (96%). Parents had generally elevated parenting stress, with the study mean falling 1 standard deviation above the normative mean.

There was a slightly larger proportion of male children in the sample (65%). For the Social Communication Questionnaire (SCQ; Chandler et al., 2007), a score of 12 – 15 (depending on a child's verbal abilities), is recommended as a clinical cut-off as a positive ASD screen (Surén et al., 2019). Thus, most of the sample would meet this criterion, with one standard deviation below the sample mean score falling at 15.37. Specifically, 85% of the sample had a score above 15. Furthermore, around 47% of children in the sample had received a diagnosis of ASD. Most children were eligible for and receiving early childhood special education services through an IEP or IFSP. Children had relatively elevated challenging behaviors, with the sample mean T-score falling 1.8 standard deviations above the normative mean for the CBCL.

Table 1

Family demographic information for participants who completed demographics survey (N = 260 / 265)

Child Demographics	% (N) / M (SD)	Family Demographics	% (N) / M (SD)
Age	4.19 (0.89)	**Parent Age**	37.32 (7.7)
Child Gender: Male	65.77% (171)	**Parent Gender:** Female	96.5% (251)
Child Race[a]		**Relationship to Child**	
White	33.08% (86)	Biological Parent	93.46% (243)
Black/African American	8.85% (23)	Adoptive/Foster Parent	6.15% (16)
Asian	2.69% (7)	Kinship/Relative	3.08% (8)
Native/Pacific Islander	1.15% (3)	**Parent Years Education**	13.06 (3.30)
Other	1.92% (5)	**Income**	$62,516 ($59,123)
Multiracial	12.32% (33)	Below US Poverty Line	26.92% (70)
Child Ethnicity		**Siblings in Home**	1.56 (1.21)
Hispanic/Latinx	66.15% (172)	**Sibling with a Disability**	49.25% (132)
Bilingual	54.62% (142)	**Language in Home**	
Primary Diagnosis		Spanish	39.23% (102)
Autism Spectrum	46.92% (127)	English	55.38% (144)
Developmental Delay	12.31% (33)	Other	5.38% (14)
Speech/Language Delay	16.54% (45)	**Location**	
Other	22.01% (59)	Oregon	13.08% (34)
IFSP/IEP	68.85% (179)	California	86.92% (226)
SCQ Total	21.83 (6.46)	**PSI Total T-Score**	60.90 (5.9)
VABS ABC[b]	73.29 (9.94)		
CBCL Total T-Score	68.31 (10.11)		

Note. [a] Categories not mutually exclusive; [b] Available for 58 participants. IEP = Individualized Education Plan; IFSP = Individualized Family Service Plan. SCQ = Social Communication Questionnaire, VABS ABC = Vineland Adaptive Behavior Scales, Adaptive Behavior Composite, CBCL = Child Behavior Checklist, PSI = Parenting Stress Index.

Procedure

Families were screened for eligibility via phone prior to enrollment in the study. Consent procedures were followed with families prior to data collection. Ethics and research compliance for the study were followed in accordance with the UO IRB, Protocol #03212018.023. Data for this study were collected at baseline, or prior to intervention randomization. Families were compensated $100 for their participation in baseline data collection. Parent-report surveys were

conducted via mail home surveys, or online via Qualtrics. Observational data were collected in the home, with a research assistant utilizing standardized instructions and timings for the tasks.

Observational Data Collection

Observational data were video recorded either via video camera in the home (for data collected prior to the COVID-19 pandemic), or via the telecommunications platform, Zoom, with participants' webcams, or study provided tablets and Wi-Fi hotspots. The observed activities included a 10-minute free-play task, a 2-minute clean-up task, and a 3-minute structured activity task. Observational data were coded using the Coder Impressions Inventory (COIMP; Dishion et al., 2004) with revisions for the RCT (McIntyre et al., 2019). Recorded video observations were coded by raters offline in confidential spaces. For each item, coders rated parents from a scale of 1 = *not at all* to 9 = *almost always*, on their behaviors across the 3 observed parent-child interaction tasks. Coders included trained graduate students, who attended ongoing meetings to maintain reliability with behavioral ratings. Coders were trained to maintain 80% inter-observer agreement (IOA) across COIMP codes, within an agreement margin of 2 points. Average IOA was 88% for items used in this study. IOA for items retained in final analyses was also 88%.

Measures

Child Emotion Regulation

The Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997) was used to measure child ER. The ERC is a 24-item parent report measure, with items rated on a 4-point Likert scale (1 = *Never*; 4 = *Almost Always*). The ERC yields two psychometrically derived subscales, the Lability/Negativity subscale (15 items), and the Emotion Regulation subscale (8 items). Lability/negativity indicates level of emotionally dysregulated behavior, while emotion

regulation indicates levels of adaptive emotion regulation behaviors. Internal consistency within this sample for the Lability/Negativity subscale was high, $\alpha = 0.82$, while for the ER subscale, was adequate, $\alpha = 0.69$. Past research has shown this measure to capture elevated emotion dysregulation in children with DD, compared to those without (Norona & Baker, 2017).

Observed Child Emotion Dysregulation

To measure child dysregulation within a parent-child interaction, a scale was constructed using the Coder Impressions Inventory (COIMP; Dishion et al., 2004), selecting items that conceptually align with child dysregulation (Table 6). To confirm the construct validity of this scale, a one-factor and two-factor structure was examined with Confirmatory Factor Analysis.

Observed Emotion Dysregulation in Parenting

To measure parent emotion dysregulation in the context of parenting, a scale was constructed using the Coder Impressions Inventory (COIMP; Dishion et al., 2004), selecting items that conceptually align with ER (Table 6). To confirm the construct validity of this scale, a hypothesized one-factor structure was examined with Confirmatory Factor Analysis.

Parent Emotion Dysregulation

The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was used to measure parents' general ER. The DERS captures broad dimensions of emotion dysregulation, including difficulties in various aspects of ER including awareness of emotions, engagement in goal-directed behavior, and access to effective ER strategies. Parents self-report across 36 items on how often the items apply to themselves, on a 5-point scale (1 = *Almost never*, 5 = *Almost always*). For this study, the total score was utilized to represent general parental dysregulation. This score showed high internal consistency, $\alpha = 0.95$.

Parent Stress

Parent stress was measured using the Parent Stress Index – Short Form, 4th Edition (PSI-4; Abidin, 1997), and the Parent Daily Hassles Measure (Crnic & Greenberg, 1990). For the PSI-4, parents rate 36 items on a 5-point scale (1 = *Strongly Agree*, 5 = *Strongly Disagree*) that measure parenting stress related to 1) parent factors, 2) child behaviors, and 3) parent-child interactions. For analyses, the parent distress subscale was used (current study $\alpha = 0.87$).

The Parent Daily Hassles consists of 20 items describing common or "daily" hassles most parents experience in their caregiving role. Parents rate how often each event occurs (1 = *Rarely*, 4 = *Constantly*), as well as how much of a hassle they feel the event is (1 to 5). These ratings comprise the frequency and intensity scales, which were used as separate variables in analyses. These scores showed high internal consistency (frequency $\alpha = 0.87$; intensity $\alpha = 0.91$)

Child Challenging Behavior

Child Internalizing and Externalizing symptomatology were measured using the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000). Parents rated the degree to which their child has exhibited a range of problem behaviors across 99 items. Raw scores for the internalizing and externalizing behavior subscales were used for analysis. Internal consistency for these subscales with the current sample was high (internalizing $\alpha = 0.88$; externalizing $\alpha = 0.90$).

Data Analysis

Data analyses included both Confirmatory Factor Analyses (CFA) to confirm the measurement of observed parent and child emotion dysregulation, as well as structural equation modeling (SEM) methods to test study hypotheses. Maximum Likelihood (ML) estimation

techniques were used for model fitting and parameter estimation, which is based upon normality assumptions. Unit variance constraints were utilized to identify latent variables, with each factor's variance set to 1. Prior to testing regression paths, measurement structures were fit to establish valid measurement systems and a baseline fit of latent variable models.

Models were fit using lavaan version 0.6-9 (Rosseel, 2012) on R version 4.1.2. Model approximate fit indices were utilized to assess model fit, and including the chi-square test, root mean square error of approximation (RSMEA), standardized root mean square residual (SRMR), and comparative fit index (CFI). These indices are considered descriptive and are subject to model and data specifications such as model parsimony, number of estimated parameters, and sample size. Within SEM, cut-offs have been specified to indicate acceptable model fit, including CFI > .95, RMSEA < .08, SRMR < .08 (Hu & Bentler, 1999; Schreiber et al., 2006). Chi-square statistics are reported and utilized, but primarily for the purposes of testing improved fit with nested models. Thus, determination of model fit was assessed using a triangulation of these indices, as well as knowledge of comparison to other similar models, and overall researched performance. For example, RMSEA has been shown to overestimate for small sample sizes when using ML estimation (Hu & Bentler, 1999), whereas SRMR tends to remain stable across ML estimated models (Shi et al., 2018).

SEM figures were constructed using the tidySEM package (Van Lissa, 2019). For mediation analyses, standard errors for indirect effects were estimated using Monte Carlo simulation, using the semTools package (Jorgensen et al., 2022). For moderation analyses, the double-mean centering procedure described in Schoemann & Jorgensen (2021) was used, which was implemented with the semTools package. This method allows for testing and probing interaction effects with one to three latent variables. Latent variable indicators (observed

variables) for the predictor and moderator are mean centered, multiplied, then mean centered. Then residuals sharing item-level variances are constrained to equality, to reduce bias on estimates of latent-interaction variance. A direct effects model (without a latent interaction term) was also computed to compute direct effect and model fit estimates.

Data Missingness

For sum score (i.e., parent-reported) variables, data were only available for participants who completed the full scale (i.e., did not have missing item-level data). To handle missingness of observed variables in structural equation models, full information maximum likelihood (FIML) estimation techniques were used. This technique utilizes the total sample size available, which allows for unbiased estimations of latent variables and relationships between indicators (observed variables). FIML is considered a best practice for handling missing data in SEM and provides consistent and unbiased parameter estimates, standard errors, and fit statistics (Little & Rubin, 2019), particularly for data missing completely at random or missing at random (Enders & Bandalos, 2001).

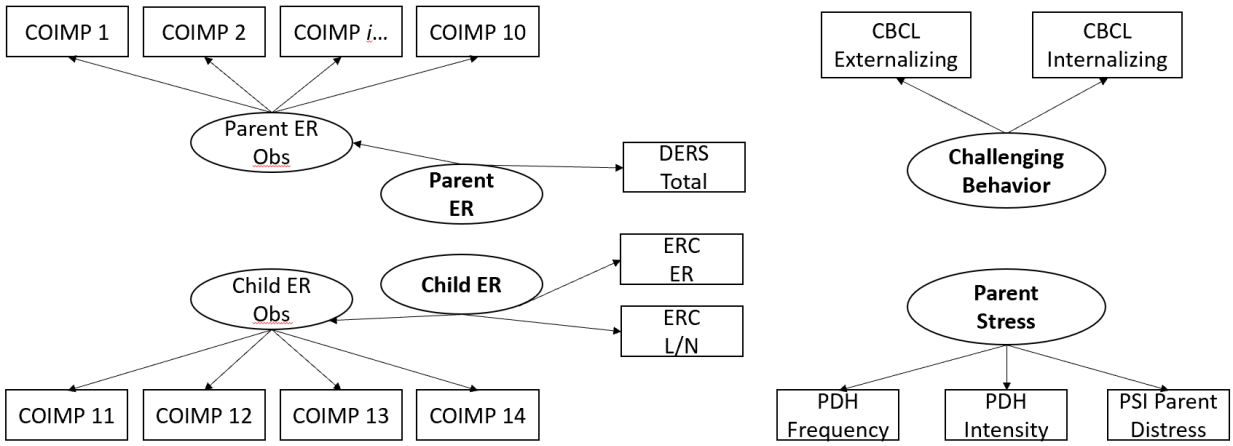
Data for this study were considered missing at random, as most missing data patterns were due to study design. Specifically, parent-reported child and parent ER (DERS and ERC) were not collected for the first cohort. Observational data (COIMP) were missing for the 5th and 6th cohorts, due to the time needed to process this data. Finally, lower rates of missing data were found for the PSI and CBCL, due to the fact they were both used as inclusion criteria. Patterns of missing data were consistent within measures of similar design considerations (~13 – 20% for parent reported measures; 2 – 11% for study inclusion variables; 4% for observation data; see Table 4) when missingness due to cohort was controlled for. Thus, FIML was considered an appropriate strategy, given the missing at random assumption was reasonable.

Latent Measurement Modeling

Constructs were modelled as latent variables. After determining a model of best fit for observed parent and child ER, a measurement model consisting of all four variables (parent ER, child ER, parenting stress, child challenging behaviors) was constructed to confirm the measurement model structure, prior to fitting regression paths. The final hypothesized measurement model is shown in Figure 4. Pairwise correlations among parent-reported variables can be found in Table 4.

Figure 4

Hypothetical measurement model. Boxes indicate observed variables, where circles indicate latent variables. Bolded variables indicate latent variables that will be estimated for use in structural (regression path) models.



Note. i… indicates iterations (10 hypothesized items for the scale).

Observed Parent and Child Emotion Regulation

For observed parent and child ER, a two-factor confirmatory factor model was constructed to confirm the relevance of COIMP items to the construct. Items contributing to misfit or with minimal factor loadings were dropped from the scale ($p > .05$; Table 6). Pairwise

correlations for individual items can be found in Tables 2 and 3; item wording can be found in Table 6.

Table 2

Pairwise correlations between parent dysregulation COIMP items (N =184).

Item	20	21	22	27	28	29	36	37	38	39
20	1									
21	0.270	1.000								
22	0.344	0.768	1.000							
27	0.211	0.455	0.345	1.000						
28	0.188	0.470	0.404	0.615	1.000					
29	0.618	0.216	0.315	0.169	0.201	1.000				
36	*-0.120*	0.209	0.132	0.114	0.138	0.124	1.000			
37	0.116	0.231	0.183	0.262	0.306	0.134	0.183	1.000		
39	0.415	0.337	0.436	0.182	0.249	0.399	0.071	0.122	1.000	
39	0.143	0.158	0.134	0.343	0.255	0.079	0.110	0.075	0.122	1.000

Note. Italics: Negative correlation. Item descriptions can be found in Table 6.

Table 3

Pairwise correlations between child dysregulation COIMP items (N = 184).

Item	43	47	48	51
43	1.000			
47	*-0.170*	1.000		
48	*-0.130*	0.807	1.000	
51	0.170	*-0.145*	*-0.095*	1.000

Note. Italics: Negative correlation. Item descriptions can be found in Table 6.

Parent Emotion Regulation

Parent emotion regulation was first tested as a latent variable, combining data from the COIMP parental dysregulation construct, and the DERS total score. However, due to inconsistent factor loadings, observational and parent-reported ER were tested in separate models (see Results, Table 7).

Child Emotion Regulation

Child emotion regulation was first tested as a latent variable, combining data from the ERC lability/negative subscale, ERC emotion regulation subscale, and the COIMP child dysregulation latent construct. However, due to inconsistent factor loadings, observational and child ER were tested in separate models (see Results, Figures 5 and 6), and the ERC ER subscale was dropped from analyses to promote congruence across parent-reported parent and child ER measures and improve measurement model fit (see Results, Figure 5).

With both parent and child emotion regulation, due to utilizing a construct that combines two methodologies for measuring a trait (i.e., parent report and observation) residual variances may be better attributable to shared method effects than independent measurement effects. Thus, for the estimation of parent and child ER variables, a correlated uniqueness model (Kenny & Kashy, 1992; Marsh, 1989) was utilized and assessed for improved fit. This method involves correlating residual variances belonging to items with shared methods, for more unbiased estimation.

Parent Stress

Parent stress was modelled as a latent variable, with raw (sum) scores from the PSI-4 parent distress scale (PD), the frequency scale, and the intensity scale for the Parent Daily Hassles. Therefore, this latent construct encompasses both demands of parenting, as well as appraisal within the conceptualization of parenting stress.

Child Challenging Behaviors

Child challenging behaviors was modelled as a latent variable, using the internalizing and externalizing raw scores from the CBCL.

Table 4

Pairwise correlations and descriptive statistics for parent-reported variables.

Variable	1	2	3	4	5	6	7
1. DERS total score	1.000						
2. ERC Lability/Negativity subscale	0.191	1.000					
3. PDH - frequency score	0.109	0.431	1.000				
4. PDH - intensity score	0.175	0.284	**0.731**	1.000			
5. PSI - Parent Distress subscale	0.331	0.038	0.278	0.355	1.000		
6. CBCL - Internalizing subscale	*-0.031*	0.474	0.359	0.130	0.062	1.000	
7. CBCL - Externalizing subscale	0.026	0.691	0.459	0.323	0.140	**0.576**	1.000
Mean	83.60	30.82	48.85	50.92	37.47	22.28	25.48
SD	24.64	6.02	15.22	20.76	9.52	11.38	8.69
N	164	173	236	236	224	243	243

Note. Italics: Negative correlation. **Bold:** Variables from same parent-report measure.

III. RESULTS

Measurement Models

Confirmatory Factor Analysis – Parent and Child Emotion Regulation

For CFA models, a subset of 182 families (total sample $N = 265$) had observational data available. Model fit for a one-factor solution for parent and child ER was poor (see Table 5). The model was respecified utilizing a three-step approach 1) visualizing standardized residuals, 2) evaluating modification indices, and 3) removing nonsignificant parameters (Brown, 2006). Standardized residuals can indicate the degree to which a model may overestimate or underestimate the relationship between a pair of indicators. Modification indices can indicate the degree to which specifying additional parameters may improve model fit (i.e., cross-loading items, correlating residual variances). Removing parameters is best done at the end of a re-specification process, as model misfit can contribute to bias in parameter estimates (Brown, 2006). With any model re-specification changes, theoretical reasoning must support changes. Without substantiative theoretical basis, respecified models may overfit data, or may compromise interpretability.

Respecified Confirmatory Factor Models – Parent and Child Emotion Regulation

Based on dimensional theories of emotion (Russell, 1980), a two-factor solution for hyper-aroused vs hypo-aroused dysregulated emotions was hypothesized and tested. This model conceptualizes the experience of emotions as falling within dimensions of arousal and pleasure. All items fell within a range of unpleasant emotions. Thus, items were hypothesized to have greater variation along dimensions of accompanying arousal. Dimensional theories establishing emotions falling within the dimensional categories of hyper-aroused versus hypo-aroused and positive versus negative (valence) have been utilized in confirmatory factor analyses of self-

reported data in adults (A. Tellegen et al., 1999) and children (Walden et al., 2003). Furthermore, theories suggest where individuals fall within a quadrant of low pleasure – high displeasure and hypo-aroused – hyper-aroused, may explain comorbidity of internalizing symptoms (i.e., depression and anxiety; Clark & Watson, 1991). This re-specification also aligns with original hypotheses that child dysregulation may fall into externalizng and internalizing dimensions.

Table 5

Fit Estimates for Parent and Child ER Confirmatory Factor Models.

Model	χ^2 ***diff***	χ^2	**df**	**CFI**	**RMSEA [90% CI]**	**SRMR**
1 factor parent/child	-	302.638	76	0.719	0.128 [0.113, 0.143]	0.106
2 factor parent/child	39.368***	263.269	71	0.762	0.122 [0.106, 0.138]	0.095
Cross loadings for items 21, 22	72.856***	190.414	69	0.850	0.098 [0.082, 0.115]	0.085
Dropped non-significant loadings	-	160.348	49	0.857	0.112 [0.093, 0.131]	0.088
Correlated error variances	49.153***	111.195	48	0.919	0.085 [0.064, 0.106]	0.079

Note. *$p < .05$, ** $p < .01$, ***$p < .001$

A two-factor model for parent and child ER provided significantly improved fit, based on the chi-square difference test (Table 5). Items hypothesized to cross-load were tested, which provided significantly improved fit. This, however, resulted in non-significant factor loadings of the items (21, 22) on the hypo-aroused factor. Once non-significant factor loadings were dropped, and residual variances were set to covary for two similarly worded items, final model fit was acceptable (χ^2 (48) = 111.195, $p < .001$, CFI = .92; RMSEA = .085, 90% CI [.064, .106]; SRMR = .79), and demonstrated improved fit compared previous models (Table 5). Final standardized estimates can be found in Table 6. Parent ER factors (termed overwhelm and dysphoria) were moderately and positively correlated ($r = 0.45$, $p < 0.001$), while child ER factors were negatively and modestly correlated ($r = -0.17$, $p = 0.02$). Thus, parent ER factors represent distinct, but related processes related to dysregulation.

Table 6

Standardized factor estimates for final CFA model, with parent and child ER each comprising of engaged versus disengaged emotion dysregulation.

	Standardized factor loading	
	ER Subscale	
COIMP Item	**Overwhelmed**	**Dysphoric**
Parent Emotion Dysregulation Items		
20. Does the parent seem 'tired-out', depressed, or 'out of it' during the task?		.798
21. Does the parent seem stressed out during the task?	**.839**	NA
22. Does the parent seem overwhelmed during the task?	**.913**	NA
27. Does the parent generally display anger, frustration, and/or annoyance during activities?***	**.486**	
28. Does the parent seem negatively emotionally reactive to the child or situation?***	**.506**	
29. Does the parent seem to act without thinking or "run on autopilot"?		.750
36. Does the parent make affective communication errors (e.g., talks in inviting voice, but physically blocks access)?	**.210**	
37. Does the parent engage in role confusion (e.g., draws attention to self when child is in need)?	**.264**	
38. Does the parent seem disoriented when interacting with the child (e.g., appears confused, hesitant, or frightened; displays incongruous affect to the child and the situation)?		.558
39. Does the parent demonstrate any negative-intrusive behavior (e.g., mocks or teases child and his or her behavior/statements)?	**NA**	
Child Emotion Dysregulation Items		
43. Does the child seek out the parent, indicating reliance on the parent for reassurance and/or safety?		NA
47. Does the child seem dysregulated and difficult to manage, unable to control his/her behavior and emotions?	**1.053**	
48. Does the TC become overly upset or angry with tasks or changes in routines (e.g., putting toys away)?	**.766**	
51. Does the TC become anxious, timid, or shy? (e.g., hides behind parent; nervous around assessors; looks at parent for approval/security)		NA

Note. Bolded items indicate hypothesized item loading to the "overwhelmed" factor. Italics signify items hypothesized to cross-load. *** = residuals variances correlated. NA indicates the item was dropped from the subscale for the final model, and thus, estimates are not reported.

For the child ER factors, due to the "hypo-aroused" factor being reduced to one item and being negatively correlated with the "hyper-aroused" factor, these results indicate the two factors measure distinct constructs. However, the two items on the "overwhelm" subscale indicated strong loadings. Thus, the child "dysphoric" factor was not confirmed to be a valid construct of emotion dysregulation and was not included in further analyses.

Latent Variable Models – Parent and Child Emotion Regulation

For full latent variable and structural models, data from the full sample (N = 265 families) were used. An initial model fitting both parent-reported and observation measures of parent and child ER as latent variables indicated adequate fit (χ^2 (72) = 139.24, $p < .001$; CFI = .91, RMSEA = .061, 90% CI [0.045 - 0.076]; SRMR = .079). However, parent report measures, as well as the parent ER dysphoric factor did not significantly load onto their respective latent factors (see Table 7). Following two respecified models, where 1) the dysphoric dysregulation factor was dropped, and 2) residual variances were correlated for similar methods to account for variance due to method effects (correlated uniqueness model; Kenny & Kashy, 1992; Marsh, 1989) parent-reported and observed parent and child ER did not significantly load onto a similar factor.

The final model results indicate that, when accounting for variance due to shared method effects (parent-report versus observation), parent-reported and observed emotion dysregulation do not measure a similar latent construct. Therefore, to test initial hypotheses, subsequent structural models tested parent-reported and observation measures for ER separately, to determine in which contexts of emotion dysregulation these hypotheses are supported.

Table 7

Parameter and Fit Estimates for Parent and Child Emotion Regulation Latent Variable Models. Factor estimates are standardized.

	Model 1	***Model 2***	***Model 3***
Parent Emotion Regulation	***Initial Model***	***Dysphoric factor dropped***	***Correlated Uniqueness***
Parent Dysregulation – Dysphoric	0.328	--	--
Parent Dysregulation – Overwhelmed	1.435	0.677	0.173
Parent Reported Dysregulation	3.402	0.223	0.803
Child Emotion Regulation			
Observed Child Dysregulation	0.808	0.715	0.203
Parent Reported Child Dysregulation – Lability/Negativity	0.864	0.216	0.518
Parent Reported Child Dysregulation – Emotion Regulation (Reverse)	0.512	0.164	0.434
Model Fit Estimates			
CFI	0.91	0.94	0.96
RMSEA [90% CI]	0.058 [.044 - .072]	0.059 [.038 - .079]	0.049 [.024 - .071]
SRMR	0.080	0.078	0.068
AIC	9945.91	5135.92	8665.24

Note. *$p < .05$, ** $p < .01$, ***$p < .001$.

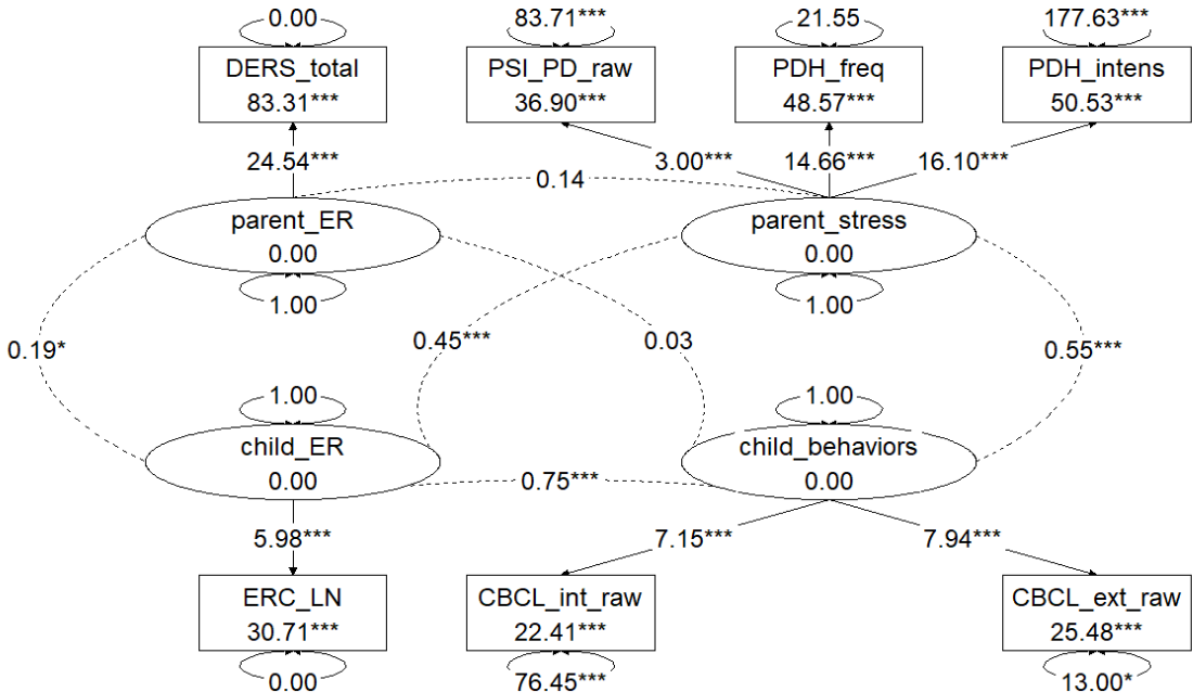
Latent Variable Measurement Model – Parent Report

Due to the need to model parent-reported and observational ER constructs in separate models, model identification constraints occurred due to multiple latent variables having less than three indicators. Thus, child ER was modelled as an observed variable rather than a latent variable, using the lability/negativity ERC subscale only. This subscale both best represents the construct of emotion dysregulation and mirrors the child dysregulation latent variable for observational data.

Figure 5 displays the latent variable measurement model for parent-report data. The model demonstrated adequate fit (χ^2 (10) = 46.89, $p < .001$; CFI = 0.94; RMSEA = 0.11, 90% CI [0.085 – 0.15]; SRMR = 0.069).

Figure 5

Measurement Model for parent report ER. Correlations among latent variables are indicated with dashed lines. Residual variance estimates are shown within indicator boxes, double-headed arrows on indicators signify error terms.



Note. *p > .05, **p < .01, ***p < .001

Latent Variable Measurement Model – Parent Report and Parent Observation

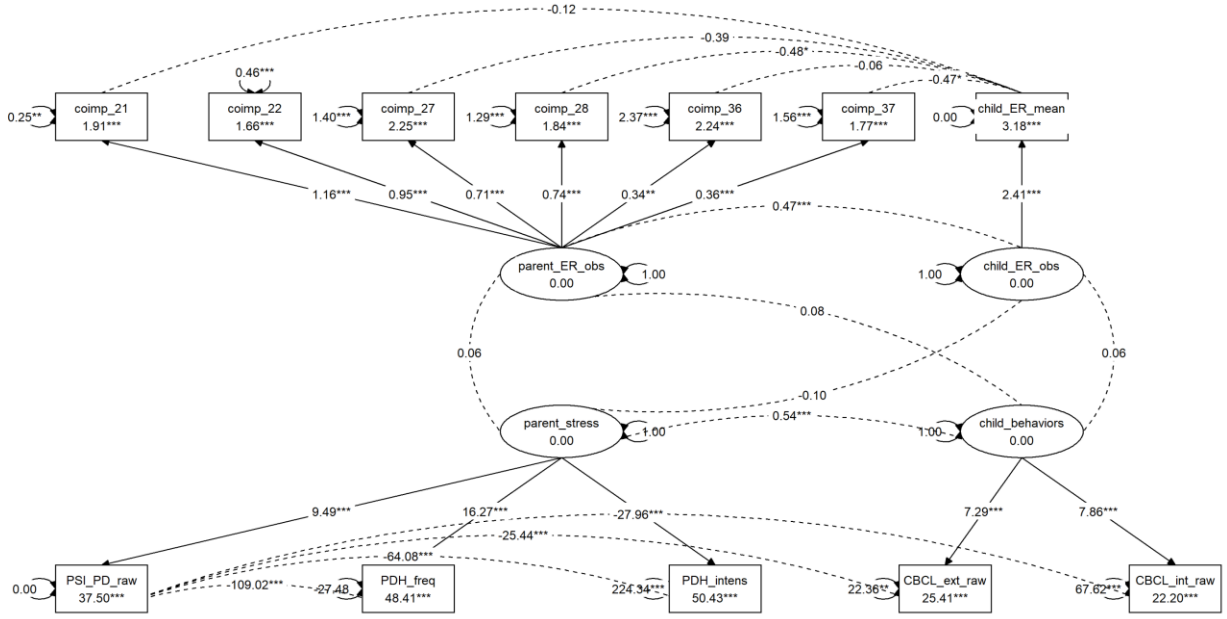
Similar to the parent-report measurement model, identification constraints occurred due to multiple latent variables having less than three indicators. Thus, since the two COIMP items for the child ER construct were highly correlated (r = 0.8), these items were averaged to create an observed variable for child ER, rather than a latent variable.

The initial measurement model fit was adequate (χ^2 (49) = 144.46, p < .001; CFI = 0.88, RMSEA = 0.084, 90% CI [0.069 – 0.101]; SRMR = 0.070). Due to multimethod measurement within the model (i.e., parent report and observational data), a correlated uniqueness model was

also fit, correlating residual variances between same method observed variables (e.g., parent-reported stress and child behaviors, observed parent and child ER). Fit was significantly improved ($\chi^2_{difference}$ = 36.367, $p < .001$), and overall provided improved indicators of model fit (χ^2 (41) = 108.09, $p < .001$; CFI = 0.91; RMSEA = 0.077, 90% CI [0.060 – 0.095]; SRMR = 0.061). Figure 6 displays the final measurement model for observation ER data.

Figure 6

Measurement Model for observation ER, using a correlated uniqueness approach. Covariances are estimated for measures of similar methods (i.e., observation and parent-report). Correlations among latent variables are indicated with dashed lines. Residual variance estimates are shown within indicator boxes, double-headed circles on indicators signify error terms.



Moderation Models: Does parent stress moderate the relationship between parent ER and child ER?

Parent Report ER Model

Model fit for the direct effects model was poor (χ^2 (5) = 38.82, $p < .001$; CFI = 0.88; RMSEA = 0.160, 90% CI [0.115 - 0.209]; SRMR = 0.11). Parent stress did not significantly moderate the effect of parent's self-reported ER scores on children's ER scores ($p = .091$). Parent stress and parent ER both had direct effects on children's ER scores ($p < .05$). Standardized estimates indicated parent ER had a stronger influence on children's ER scores than did parent stress (Table 8).

Table 8

Estimates for parent stress and parent reported parent ER, and interaction term on children's ER.

Predictor	Estimate	SE	p-value	Std. Estimate
Parent Stress	2.338	0.490	< 0.001	0.348
Parent ER	0.116	0.053	0.030	0.423
Parent Stress * Parent ER	-2.217	1.310	0.091	-0.330

Observation ER Model

Fit measures for the direct effects model indicated good fit (χ^2 (30) = 55.21, $p < .001$; CFI = 0.96; RMSEA = 0.055, 90% CI [0.032 - 0.078]; SRMR = 0.060). Parent stress significantly moderated the effect of observed parent dysregulation on children's dysregulation within a parent-child interaction task ($p = 0.017$). Specifically, higher levels of parenting stress led to a strengthened relationship between observed parent and child dysregulation. Specifically, for parents with a mean level of parent stress, for every standard deviation above the mean in observed parent dysregulation, children's dysregulation increased by 0.41 points (Table 9).

Table 9

Estimates for parent stress and observed parent ER, and interaction term on observed child dysregulation.

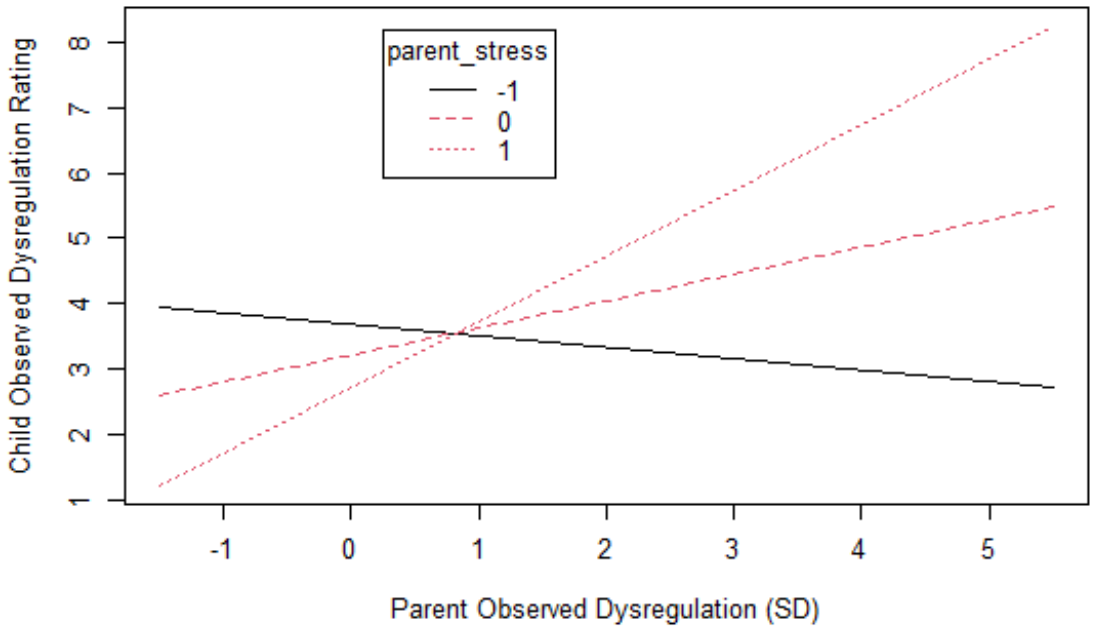
Predictor	Estimate	SE	p-value	Std. Estimate
Parent Stress	-0.029	0.179	0.007	-0.197
Parent ER	0.414	0.174	0.017	0.168
Parent Stress * Parent ER	0.591	0.196	0.003	0.240

However, for parents with a higher level of parenting stress, as defined as 1 SD above the mean, for every standard deviation increase in observed parent dysregulation, children's dysregulation ratings increased by .59 points.

The mean rating for child ER was 3.12 points, which corresponds to a rating in between "not at all" and "somewhat" true for the observation. Thus, parents with stress levels at least 1 SD above the mean, and average to above average levels of emotion dysregulation during the parent-child interaction, were likely to have a child fall in the "somewhat" to "very much" range for their levels of emotion dysregulation (Figure 7). Contrastingly, parents with average stress levels would need to display emotion dysregulation 11 SDs above the mean for a child to reach the "somewhat" to "very much" range.

Figure 7

Interaction effect of parent stress and observed parent dysregulation on child ER (score range = 1 – 9).



Note. The legend indicates high, low, and average levels of parenting stress, defined as 1 standard deviation below (solid), average (medium dash), and 1 standard deviation above (small dash). Red indicates significance of the interaction at the $p = 0.05$ level.

Mediation Models: Does child ER or parent stress mediate the relationship between parent ER and child challenging behaviors?

Parent Report ER Model

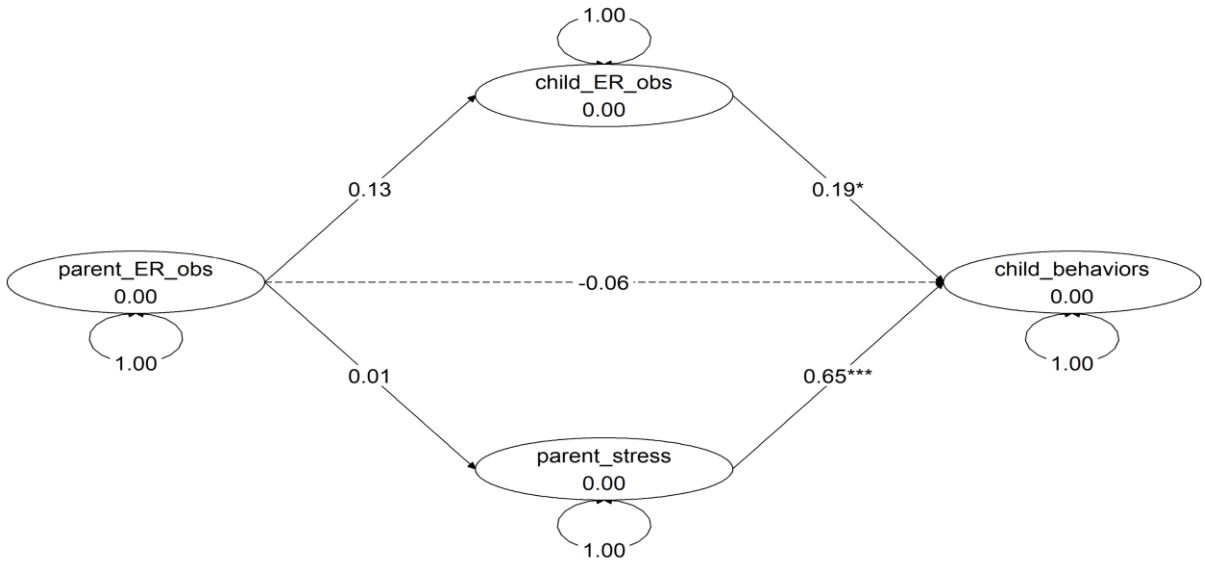
Model fit was poor (χ^2 (11) = 80.58, $p < .001$; CFI = 0.87; RMSEA = 0.15, 90% CI [0.124 - 0.187]; SRMR = 0.116), thus the model could not be interpreted, due to potential for biased estimates. Chi-square tests indicated the original measurement model with no regression paths fit significantly better than the structural model ($\chi^2_{difference} = 33.70$, $p < .001$).

Observation ER Model

Model fit was adequate (χ^2 (40) = 89.35, $p < .001$; CFI = 0.94; RMSEA = 0.067, 90% CI [0.049 - 0.086]; SRMR = 0.062). Chi-square tests indicated the structural model with regression paths fit significantly better than the original measurement model ($\chi^2_{difference}$ = 18.74, $p < .001$).

Figure 8

Simplified Structural Mediation Model for the effects of observed parent ER on child behaviors through parent stress and child ER. Path estimates are unstandardized. Dashed lines are used for direct paths.



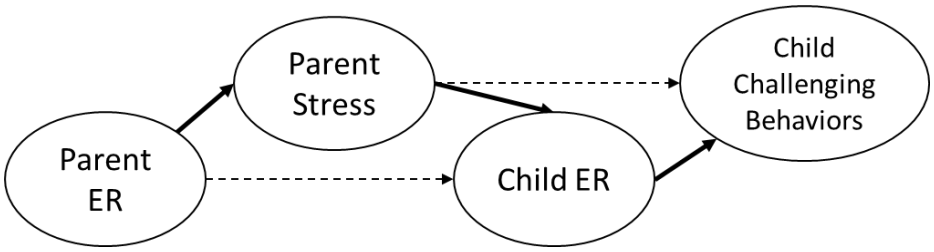
Note. *$p > .05$, **$p < .01$, ***$p < .001$

Exploratory Models

Due to parent ER not being directly related to children's challenging behaviors within initial analyses, an exploratory model was run, respecifying model paths. Specifically, parental ER may influence children's behaviors through both parent stress and child ER, in a sequential fashion. Thus, it was hypothesized parent dysregulation leads to child dysregulation through parenting stress, and parenting stress leads to children's challenging behaviors through child dysregulation (see Figure 9).

Figure 9

Conceptual Model for exploratory mediation analyses. The dotted line indicates a direct path. The hypothesized model indicates the direct path from parent ER to child ER is better explained through parenting stress, and the relationship between parenting stress, and children's challenging behaviors is better explained by children's ER.

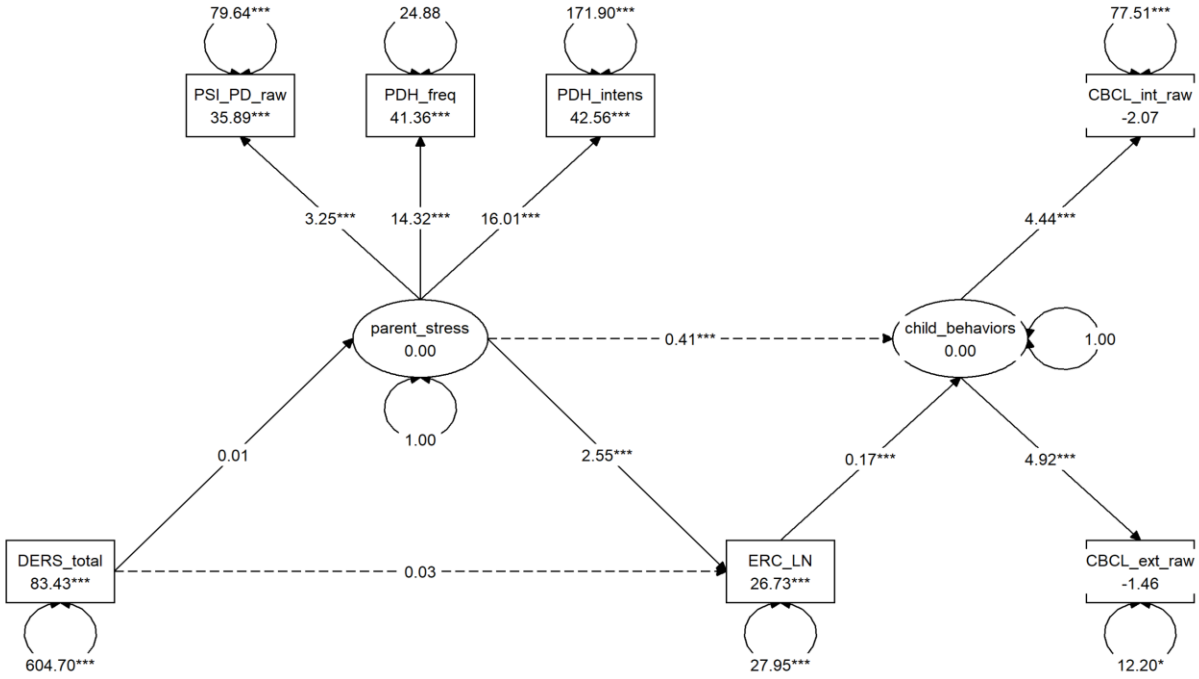


Parent Report ER

Model fit statistics were adequate (χ^2 (11) = 52.90, $p < .001$; CFI = 0.92, RMSEA = 0.12, 90% CI [0.089 - 0.153]; SRMR = 0.07), and so estimates were assumed to be reliable. The new hypothesis was partially supported – child ER partially mediated the pathway from parent stress to children's challenging behaviors, ab path = 0.438 [95% CI: 0.264 - 0.640], explaining 52% of the total variance. However, there was not a significant direct effect of parent ER on child ER, nor an effect of parent ER on parenting stress. Thus, parenting stress did not mediate the relationship between parent and child ER. Path estimates are plotted in Figure 10.

Figure 10

Model estimates for sequential mediation model for parent-reported ER. Dashed lines indicate direct paths.



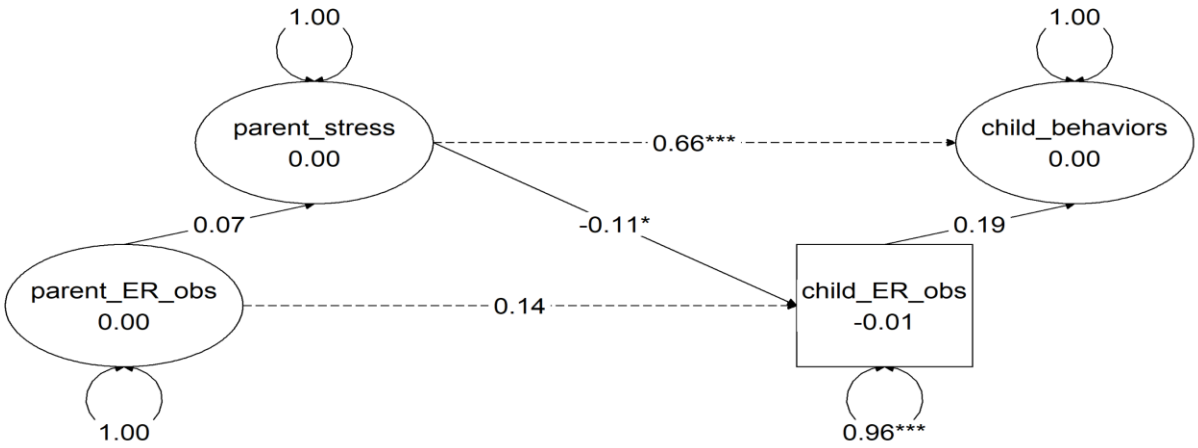
Note. *p > .05, **p < .01, ***p < .001

Observation ER

Model fit was good (χ^2 (40) = 90.74, p < .001; CFI = 0.93, RMSEA = 0.068, 90% CI [0.050 - 0.087]; SRMR = 0.060), thus estimates were assumed to be reliable. For parent and child observed dysregulation, the new hypothesized model was not supported. Parent stress did not mediate the relationship between parent and child ER, due to lack of a direct path between parent and child ER. Parenting stress had a significant and strongly related direct path to children's challenging behaviors (β = 0.548), controlling for parent ER. However, observed child ER did not mediate this process. Path estimates are plotted in Figure 11.

Figure 11

Model estimates for sequential mediation model for observed ER. Dashed lines indicate direct paths.



Note. **p* > .05, ***p* < .01, ****p* < .001

IV. DISCUSSION

The purpose of this study was to explore how parent and child ER contribute to the well-established link between parenting stress and children's challenging behaviors. The study also sought to establish a measurement structure for items measuring parent and child emotion dysregulation during a parent-child interaction task, using Confirmatory Factor Analysis.

Consistent with previous studies (Crnic et al., 2005; Lin et al., 2021; Neece et al., 2012), the results of this study indicated a strong link between parenting stress and children's challenging behaviors. However, contrary to initial hypotheses and previous literature (Zimmer-Gembeck et al., 2021), this study failed to confirm a direct path from parent dysregulation to children's challenging behavior. Instead, children's dysregulation consistently predicted children's challenging behaviors, and was found to partially mediate, or explain the link between, parenting stress and children's challenging behaviors. This group of findings reinforces the importance of considering child dysregulation as a mechanism towards the development of challenging behaviors in preschoolers with DD.

While parent dysregulation did not directly influence children's challenging behaviors, consistent with previous literature, this study confirmed a modest link between parent and child dysregulation across parent reported and observational measures (r = .15 – .19). Consistent with initial hypotheses, parenting stress moderated this relationship, such that parent-child dysregulation was strongest for families with higher levels of parenting stress. However, this finding was only true for dysregulation in the context of a parent-child interaction, and not for parent-reported ER measures. This group of findings further clarify the transmission of parent dysregulation to child dysregulation – which appears to be less of a result of individual differences in parents' general ER capacities, and more of a result of emotion dysregulation

within parent-child dynamics. Further, this dynamic is most apparent in families currently experiencing high levels of stress. This finding warrants further investigation to understand the dynamic between parent ER and parent stress, especially for families of children with DD.

Finally, contrary to initial hypotheses assuming a one-factor dimensional structure of emotion dysregulation, the CFA supported a two-factor solution for parent and child emotion dysregulation. These results are consistent with well-established two-factor models of emotions (Russell, 1980; A. Tellegen et al., 1999), which places emotion on a grid ranging in valence (positive – negative) and arousal (engaged – disengaged). This finding has implications for both measurement of ER, as well as the conceptualization of how emotion dysregulation contributes to pathways to prolonged emotional distress, such as intergenerational transmission of mental health conditions.

Taken together, the findings of this study supply initial clarity on how ER contributes to the relationship between parenting stress and children's challenging behavior among families of children with DD. Firstly, parent ER, including emotionally dysregulated parenting, may not directly influence children's challenging behaviors. It also seems parenting stress serves as a moderator, rather than a mediator, for the relationship between parent and child ER, particularly for emotionally dysregulated parent-child interaction dynamics. Finally, these findings underline the importance of children's ER in the progression of children's challenging behavior in early childhood.

Parenting Stress and Emotion Dysregulation

Partially consistent with the study's initial hypothesis, parenting stress moderated the relationship between parent and child dysregulation, specifically, with higher levels of stress amplifying this relationship. Having low to average levels of parenting stress was a protective

factor in the transmission of parental dysregulation to children's dysregulation. However, this effect only occurred for parent and child dysregulation in the context of an observed parent-child interaction, and not for parent-reported data. In this study, parenting stress was conceptualized both as the experience of stressors, and the appraisal of such stressors. Thus, emotionally dysregulated parenting in "high stress" parents may indicate levels of stressors that have exceeded the parents' personal capacity and resources, which may include parenting a child with higher levels of emotion dysregulation. Parent-reported ER difficulties as measured by the DERS likely represents a separate process from that of observed during parent-child interactions, as the DERS captures general ER capacities, rather than ER in the context of parenting.

Within the ABC-X model of parenting stress (McCubbin & Patterson, 1983), parents' general ER capacity may either represent a resource, or could affect how parents appraise whether personal resources are mismatched with stressors. Accordingly, a different structural model, differentiating the experience of stressors from stress might better represent the interaction of parents' ER with parenting stress (i.e., Does parents' ER moderate the relationship between the experience of parenting stressors and the experience of parenting stress?).

Similarly, the trajectory of children's ER development (including dysregulation), may also better represent a stressor for parents. Parents' ER capacity, as well as the experience of other stressors, and presence of other resources, would likely influence the degree to which differences in children's ER development, such as delays or higher rates of dysregulation, would result in the experience of parenting stress. For example, child dysregulation predicted the appraisal of parenting stressors in a sample of children with ADHD (Walerius et al., 2016). Research also suggests individual differences in stress sensitivity may influence parents' ER, and

downstream effects to children's ER development, through emotion socialization processes (Laurent, 2014; Morris et al., 2007).

Congruent with the tripartite model of familial influence on children's ER (Morris et al., 2007), this study demonstrated that children's ER is influenced by parental factors, through the interaction of parenting stress and emotionally dysregulated parenting. While not explicitly measured in this study, parenting strategies may be a contributing mechanism to how parenting stress and parental ER capacities (Chan & Neece, 2018) interact with child dysregulation.

The results of the CFA supporting a dimensional approach to emotion dysregulation may also have implications for future research on 1) familial influence towards children's ER development, as well as 2) intergenerational transmission of emotional disorders, such as anxiety and depression. As the two factors for parental dysregulation were only moderately correlated (r = 0.45), these constructs represent differential dysregulation processes. These two dysregulation processes may have separate effects on parenting dynamics, as well as children's development. For example, literature examining the influences of parenting behaviors on children's development has found "harsh" or "hostile" parenting styles may influence the development of children's ER, as well as children's challenging behavior (Chang et al., 2003; Sarıtaş et al., 2013). This style of parenting encompasses "reactive" parenting practices, thus the "over-aroused" (i.e., overwhelmed factor) element of emotion dysregulation, may play a stronger role in these dynamics.

In contrast, the "under-aroused" (i.e., dysphoric factor) element of emotion dysregulation may play a stronger role within intergenerational cycles of internalizing symptoms, such as anxiety and depression. Multiple studies have shown that specific aspects of maternal ER mediate the link between maternal depression, and youth's internalizing symptoms (Coyne &

Thompson, 2011; Felton et al., 2021), including children with DD (Ip et al., 2021). This process may also be mediated by specific aspects of children's ER, with children of mothers with depression being more likely to engage in passive (rather than active) ER strategies. A pattern of developmentally prolonged use of passive ER strategies is documented in children with DD. Thus, parents' withdrawn dysregulation may be a useful construct to examine how internalizing symptoms are transmitted from parents to children with DD. For families of children with DD, this process may be particularly dynamic, with children's passive ER strategy use also predicting parenting stress (Nuske et al., 2017).

The Role of ER in Parent-Child Dynamics

Contrary to previous literature in both youth with DD and neurotypical youth (Aydin, 2022; Zimmer-Gembeck et al., 2021), this study did not find a direct path from parent's dysregulation to children's challenging behavior, for parent reported or observed parent dysregulation. Previous meta-analytic literature does show both inconsistency and variability between parents' ER skill use and children's externalizing behaviors (95% CI, r = -.17 to .16, p > .05), as well as variability in the relationship between parents' emotion dysregulation and externalizing behaviors (95% CI, r = .07 to .29). In contrast, the relationship between children's internalizing behaviors and parent ER measures are more robust and consistent (Zimmer-Gembeck et al., 2021). In the current study, the latent variable of children's challenging behaviors indicated a higher factor loading for externalizing versus internalizing behaviors, which may have contributed to the lack of direct effects between parents' emotion dysregulation and children's challenging behavior.

Consistent with previous literature (Korbut et al., 2020; Maddox et al., 2018; Samson et al., 2015), children's emotional dysregulation during parent-child interactions significantly

predicted parents' reports of children's challenging behaviors. Parent-reported child emotion dysregulation was also strongly correlated with children's challenging behaviors (r = 0.75). The consistency of this relationship across multi-modal methods underlines the significance and importance of child ER in understanding the development and maintenance of children's challenging behaviors.

A key strength of this study included the use of multimodal measurement techniques for child and parent ER. These measures did not map onto the same construct of ER using CFA techniques, even when accounting for measurement modality variance, signaling they likely represent separate facets of ER. Additionally, investigating these constructs in separate models revealed different relationships between how parent ER contributes to parenting stress and children's emotional development. It appears parental emotion dysregulation within the parenting context has a greater impact on both parenting stress, and children's emotion dysregulation. Parents' general ER capacities did not appear to have a direct impact on overall parenting stress or children's challenging behaviors. As mentioned, while not investigated in the current study, parents' general ER capacities may affect specific facets of parenting stress (i.e., appraisal), and specific facets of parent ER likely have implications for children's emotional development. Contrastingly, children's ER across both modalities were predictive of children's challenging behavior.

These results have implications for both future research in terms of measurement selection and for intervention. For future research, understanding which facets of parent or child behavior are being captured by parent-report versus observation measures, will yield more precise findings. Some behaviors may be more likely to be convergent across measures (i.e., externalizing behaviors, child expressive language; Cotter & Brestan-Knight; Miller et al., 2017),

whereas other behaviors may vary across method, or context. Nuanced findings for the role of parent ER also have clear implications for intervention. As this study found effects were specific to emotion dysregulation within the parenting context, this calls for a greater emphasis on coaching parents to help regulate emotions in a parenting context (as a target to reduce parenting stress/children's dysregulation), rather than increasing parents' general ER capacities.

Implications for Intervention

The role of child ER as a predictor of children's challenging behaviors entails clear implications for intervention – such that increasing children's ER capacities may help to prevent challenging behaviors. ER has been conceptualized as a transdiagnostic mechanism (Cole & Hall, 2008), and treatment target (Barlow et al., 2020) across both internalizing and externalizing behaviors. Considering developmental trajectories of ER within children with DD, with prolonged reliance on parental co-regulation and passive self-regulatory strategies, interventions focusing on promoting ER may need to take a developmental approach, providing scaffolds for skill development within a proximal range. For some children, this may involve expanding agents for co-regulation (to other adults, peers, siblings), while for other children, this may involve a range of self-regulation strategies, ranging from more passive strategies (e.g., self-soothing), to more active strategies (e.g., problem-solving).

Additionally, acknowledging the role of dysregulated emotions as an antecedent to challenging behaviors may be an important consideration for behavioral intervention approaches. Historically, behavioral approaches have conceptualized situational or external cues as a predeterminant of challenging behavior, with these cues serving as a discriminative stimulus that "challenging behavior" will lead to reinforcement. However, dysregulated emotions also may serve as internal cues for an individual to engage in challenging behaviors. For example, a child

experiencing emotion dysregulation could be experiencing feelings of anger that are difficult to extinguish, which may serve as a cue to elope, which serves a function to escape the situation, and may be additionally reinforced by extinguishing feelings of anger. While internal cues are only readily available to the individual, adults in the environment are likely aware of emotional displays that may signal dysregulation, as well as situations that precede this dysregulated state. This conceptualization may be particularly useful within parent-mediated interventions, in supporting caregivers to prompt and teach ER strategies, as well as support co-regulation.

Finally, as parenting stress is implicated in the relationship between parent and child dysregulation, interventions directly targeting reduction of parenting stress may also transmit benefits to children, through reducing dysregulation and challenging behaviors (Crnic et al., 2017). Mindfulness-based interventions, such as Mindfulness-Based Stress Reduction (MBSR), are a promising option, which have shown preliminary efficacy on reducing parenting stress (Chan & Neece, 2018; Neece, 2014), as well as reduction of children's challenging behaviors (Neece, 2014), and children's dysregulation (Chan & Neece, 2018) in parents of children with DD. As interventions employing MBSR only have shown the relationship between parenting stress and child dysregulation to be mediated by parenting practices, interventions which both support the reduction of parenting stress, as well as the deployment of effective parenting practices, such as BPT, have a high likelihood of promoting overall family wellbeing and children's emotional development (Crnic et al., 2017). Thus, future research investigating the degree to which therapies incorporating both MBSR and BPT are effective in decreasing parenting stress, children's challenging behaviors, and improving child ER may be useful for understanding how to best support families. Additionally, limited research has investigated the degree to which such therapies (both MBSR and BPT) result in changes in parent dysregulation,

especially in the context of parenting, and thus, should be considered as an outcome measure in future studies.

Limitations and Future Directions

Latent Variable Modeling and Tradeoffs to Nuance

Many of the limitations in this study result from the use of latent variable modeling to conceptualize parenting stress, parent dysregulation, and children's challenging behaviors. While latent variable modeling was a particular strength of the study in investigating overall patterns among these broad constructs, some limitations emerge to understanding nuances in these relationships. Children's challenging behaviors in this study were conceptualized as consisting of both internalizing and externalizing behaviors. While these behaviors are highly correlated and comorbid (Vaillancourt et al., 2017; Willner et al., 2016), especially among preschoolers with DD, research also suggests parental ER and stress have different relationships among the two dimensions. Parenting stress more consistently predicts the development of internalizing symptoms, whereas externalizing behaviors tend to have a more bi-directional relationship with parenting stress. Additionally, the relationship between parental emotion dysregulation and internalizing behaviors have been shown to not only be more consistent, but significantly stronger during the preschool age (Zimmer-Gembeck et al., 2021). Thus, studies investigating how parental ER contributes to children's challenging behaviors may wish to examine separate pathways for internalizing versus externalizing behaviors.

Similarly with observed parental ER, this study only investigated the impact of "overaroused" dysregulation and did not utilize the dysphoric subscale. As previously discussed, these two aspects of parental dysregulation may play a different role in parenting behaviors, as well as transmission to child dysregulation, and downstream to children's challenging behaviors.

For parent-reported ER, this study utilized a more general construct of parents' ER and utilized the DERS total score to capture overall variability in parents' ER capacities. However, previous research with the DERS has found specific subscales of the DERS, such as "lack of access to ER strategies" to be most predictive in intergenerational transfer of parents' internal emotion processes to children's emotional wellbeing. For example, lack of access to ER strategies mediates the relationship between maternal and child internalizing symptoms (Ip et al., 2021). This also extends to constructs of wellbeing, with parenting stress fully mediating the relationship between parent's lack of access ER strategies and children's social emotional development (Cox et al., 2021). Future research that is more specific to aspects of dysregulation that contribute to parenting distress, as well as influence children's emotional wellbeing, will have clear implications for interventions. For example, the findings on lack of access to ER strategies indicate increasing parents' range and implementation of ER strategies may help ameliorate parenting stress and children's mental health challenges.

This study also conceptualized parenting stress as a broad construct consisting of both the experience of stressors, and the appraisal, or impression of these events as "stressful". While this measurement serves as a strength in establishing the contribution of overall stress levels to parent-child dynamics, as well as children's social-emotional development, it fails to parse apart how parent ER contributes to the experience of parenting stress. This study did not find parent dysregulation led to greater levels of parenting stress. However, as previously discussed, this may be due to the need to differentiate the occurrence of "stressors" from the occurrence of "stress". Additionally, specific ER strategies, such as cognitive reappraisal may have a greater impact on the experience of parenting stress. Previous research has shown re-appraisal as a

cognitive coping strategy to protect against the development of internalizing disorders, and as a cross-culturally relevant strategy (Quiñones-Camacho & Davis, 2022; Young et al., 2022).

Cross-Sectional Limitations: The need for a developmental perspective

The current study utilized cross-sectional data, and while useful for exploring general relationships, causality among constructs cannot be assumed. Additionally, it is possible the lack of relationships among certain constructs, such as parent ER and parenting stress, could be explained by the cross-sectional nature of the data. For example, while this study failed to find a link between parent ER and children's challenging behaviors, prolonged states of dysregulated parenting could predict the development of internalizing and/or externalizing behaviors. For example, studies have linked behaviors related to dysregulated parenting, such as expressed emotion (including parental criticism), as causal mechanisms towards the development of externalizing behaviors, in autistic youth (Bader & Barry, 2014; Romero-Gonzalez et al., 2018).

Additionally, as parental influences on ER development are likely more extensive and prolonged among youth with DD, longitudinal research may be useful in establishing developmental trajectories of both child dysregulation, as well as development of adaptive ER in this population. For example, while longitudinal studies are still lacking, one cross-sectional study found chronological age, and not developmental level moderated the relationship between maternal co-regulation and child dysregulation in autistic youth (Baker et al., 2019). Taken with findings from the current study, these findings emphasize a need for a developmental approach for understanding which ecological factors (i.e., parenting stress, co-regulation) contribute to emotion dysregulation among youth with DD.

Observational Measurement Limitations and Future Directions

This study carries a strength in measuring parental emotional dysregulation in the context of parenting, through observational methodology. To date, much of the observational research has focused on emotional displays during parent-child interaction tasks as a proxy for dysregulation. Additionally, to date, the most common measures of emotion dysregulation in the parenting context involve parent-reported measures (Hajal et al., 2019; Pereira et al., 2017; Rodriguez & Shaffer, 2021). The factor structure of this measure was established through CFA, which provides a strong foundation for future measurement research on this tool. However, as establishing psychometric properties of this tool was outside of the scope of the current study, future research is needed to establish psychometric validity, prior to its dissemination for use in future research. For example, within the measures available from the larger RCT study, divergent and convergent validity could be established with other observational measures of parenting behavior – such as proactive parenting practices and limit setting.

Additionally, as this study sample includes a high proportion of parents who are Spanish-speaking and/or Hispanic/Latinx, this presents an opportunity to establish culturally sensitive measurement systems of emotion dysregulation. Measurement invariance analyses would help to establish if the two-factor structure still holds for Spanish-speaking families and Hispanic/Latinx families, as culture and language may shape the expression of emotions (Acevedo et al., 2020; Ramzan & Amjad, 2017). This study is limited in terms of parent gender, and so future studies may wish to establish measurement invariance across both male and female parents (Chaplin, 2015).

The measurement of child emotion dysregulation using observational methodology was limited by the number of items representing this construct that were collected as a part of the larger RCT. However, the two items comprising the factor for child emotional dysregulation

were strongly related and carried strong factor loadings. Thus, these two items may serve as a valid and feasible way to incorporate measurement of children's emotion dysregulation into studies of parent-child interactions. Similar to parent dysregulation, this study did not measure how developmental and cultural aspects may influence scores on this measure of child dysregulation– such as ethnicity, language, developmental level, or gender. Future study with this two-item observational measure may wish to establish construct validity across these groups.

For measurement of children's observed emotion dysregulation that mirrors the two-factor structure of parent emotion dysregulation, future research may wish to adapt the emotion dysregulation inventory (EDI; Mazefsky et al., 2018) to an observational coding system. The EDI was specifically created to measure emotion dysregulation in youth with ASD, with input from field experts, as well as autistic individuals, and parents of autistic youth. The items yield a two-factor solution that mirror the two-factor dimensional structure for the parent dysregulation subscale in the current study, which on the EDI are labeled reactivity and dysphoria. Reactivity encompasses "over aroused" emotions – such as anger and irritability, while dysphoria encompasses "under aroused" emotions, such as sadness and anhedonia. Items that are more objective, rather than rely on inference on the part of the observer, could be selected for the creation of an observational measure. Additionally, many other observational measures exist for capturing child emotion dysregulation and adaptive ER, which may be useful in future measurement endeavors. See Weiss et al., (2014) for a review.

Finally, this coding scheme was established with ratings across 3 separate parent-child interaction tasks, to establish a more "global" score of parent and child dysregulation. However, future studies may wish to establish validity of this scale for measuring parent and child dysregulation in the context of increased demands on the parent-child dyad. Using these tasks

with this rating system may be particularly sensitive to change in intervention. For example, many laboratory tasks exist to elicit negative emotions such as frustration or disappointment within a dyad (e.g., clean-up, locked box task, Etch-a-Sketch; Deater-Deckard et al., 2006, Gagne et al., 2011; Stansbury & Sigman, 2000).

Future Directions for Parent-Child Emotion Dynamics Research

As the finding that children's ER partially explains the relationship between parenting stress and children's challenging behaviors was established through an exploratory analysis, support of this finding would be strengthened through replication in future studies. Exploratory analyses, even when based in theory, can be subject to study-specific bias, and may lead to overestimation of true effects. Longitudinal intervention studies have found links between changes in parenting stress and children's dysregulation, supporting the current finding as a true effect. As past studies have also found a link between children's dysregulation leading to parenting stress at later time points (Kerns et al., 2017; Nuske et al., 2018), future studies may also wish to explore this dynamic using cross-lagged designs.

Finally, this study did not measure mediating factors that may explain how parenting stress links to children's dysregulation. Future research may wish to explore other factors within the tripartite model specific to the development of ER in children with DD. The tripartite model indicates children's ER develops through 1) social learning and observation, 2) parenting practices, and 3) emotional climate of the family (Morris et al., 2007).

Past research has shown the effects of parenting practices such as emotion socialization behaviors, as well as parenting behaviors to affect children's ER development among preschoolers with DD (Chan & Neece, 2018; Jacobs et al., 2019). For example, past research has shown parenting behaviors that intrude on children's autonomy partially explain how parenting

stress links to children's emotion dysregulation (Chan & Neece, 2018). Additionally, co-regulatory processes, which also encompass sensitive parenting behaviors, have been shown to promote children's ER development, reduce dysregulation (Norona & Baker, 2014), and protect against the development of children's challenging behaviors (Ting & Weiss, 2017). Thus, future studies may wish to investigate if parental co-regulatory behaviors mediate the relationship between parenting stress and children's dysregulation, particularly as co-regulation skills are amenable to intervention (Gulsrud et al., 2010).

Additionally, physiological stress reactivity may represent a biological process that can be passed down intergenerationally, and influenced by socialization agents (i.e., environmental factors). Parents' general biological reactivity to stress may inform both parenting stress and emotion dysregulation. Children's biological reactivity is both influenced by exposure to stressors in development (prenatal and postnatal), including parents' socialization to promote active recovery from activation of the neuroendocrine system, and is linked to levels of ER across development (Laurent et al., 2014). Thus, future research investigating biological underpinnings of parent-child emotion regulation is likely to benefit from physiological measurement of stress reactivity. See Laurent et al., 2014 for a conceptual review.

Lastly, the current study only focused on emotion dysregulation, which differs from adaptive ER. Specifically, emotion dysregulation indicates attempts to regulate emotions which may be less adaptive or developmentally appropriate. Past research has documented differential relations between parents' ER towards supportive parenting behaviors, and effects on children's ER (Lieneman et al., 2020; Morelen et al., 2016; Zimmer-Gembeck et al., 2021). Understanding adaptive ER strategies in children with DD may be particularly helpful developing intervention

targets, and practices to support the development of adaptive ER, and reduce emotion dysregulation (Cibralic et al., 2019; Lieneman et al., 2020).

Conclusions

The current study sought to clarify the role of both parent and child emotion regulation in the well-documented relationship between parenting stress and children's challenging behaviors, among preschoolers with DD. Results indicated children's ER may help account for the relationship between parenting stress and children's challenging behaviors. While this study also suggested an interaction between parenting stress and emotion dysregulation in the context of parenting, future research is still needed to disentangle the dynamics between parent's general ER capacities and stress – especially the experience of "stressors" versus the experience of "stress". This study also yielded a novel scale for measuring multiple aspects of emotion dysregulation within parenting, which is an emerging area of study. In addition to these implications for research, findings have clear implications for interventions which target parenting stress or children's ER development, as findings suggest both have potential to support overall family wellbeing and mental health among children with identified DD.

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