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Investigating the Association between Parental Reflective Functioning and Distress Tolerance in Motherhood

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Abstract

Parental reflective functioning, referring to the capacity of a parent to consider their child's mental states as they relate to their behavior, may support sensitive and adaptive parenting. We investigated the relationship between parental reflective functioning and tolerance of distress in a sample of recent mothers (N=59). Participants completed self-report measures of parental reflective functioning and distress tolerance, as well as two behavioral distress tolerance tasks. We also examined blood pressure and heart rate during the laboratory session. Mothers reporting more difficulty in recognizing and understanding their child's mental states displayed decreased tolerance of distress on our behavioral and self-report measures. Further, we found evidence of a relationship between these measures and assessments of peripheral physiology. These findings are discussed in the context of reflective functioning and distress tolerance in parenthood, and their implications for parenting interventions.

Keywords

parental reflective functioning; distress tolerance; motherhood; baby simulator / BSIM; affect regulation

Accumulating research is beginning to document the neurobiological and psychological changes that accompany the transition to parenthood in humans (Barrett & Fleming, 2011; Rutherford & Mayes, 2011; Swain, 2011). These findings suggest that neurocognitive faculties may support emotional reactivity and regulation to infant affective cues, and may be shaped by being in the parenting role (Bridgett, Burt, Edwards, & Deater-Deckard, 2015;

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Crandall, Deater-Deckard, & Riley, 2015; Rutherford, Wallace, Laurent, & Mayes, 2015). In particular, there has been significant interest in how reflective functioning may help scaffold adaptive parent-child interactions (Slade, 2005). Reflective functioning can be considered as the manifestation of mentalizing - the capacity to recognize and understand one's own mental states, the mental states of others, and how these mental states may influence behavior (Fonagy, 1991; Fonagy, Gergely, Jurist, & Target, 2006). This capacity, emerging in the context of early secure attachment relationships, is critical to understanding one's own mind, encouraging the formation of social relationships, as well as affect regulation (Fonagy et al., 2006).

Reflective functioning may be considered as a more generalized construct, applicable to multiple relationships and social interactions. However, it may also be a faculty that is shaped by becoming a parent - both from a neurobiological and experiential perspective (Mayes, Rutherford, Suchman, & Close, 2012). Unlike other relationships, the capacity of a parent to understand their infant's inner mental world requires greater interpretation of non-verbal signals (Luyten, Fonagy, Lowyck, & Vermote, 2012). Further, parental reflective functioning may be associated with affect regulation in the parent in a way that is not typical of other attachment relationships. For instance, a common experience for new parents is soothing their crying child. The infant cannot communicate the source of their distress, and this necessitates parents to remain regulated and consider the potential sources of discomfort or distress – potentially over significant periods of time. Consequently, caregiving may hold unique demands and experiences for parents, likely shaping cognitive faculties such as reflective functioning and mentalization.

Parental reflective functioning is a multidimensional construct that encompasses the core principles of mentalization. This includes a parent's (1) genuine interest and curiosity in their child's inner world and how their child's mental states may be reflected in their behavior (e.g., *I like to think about the reasons behind the way my child behaves and feels*); and (2) recognition of the opacity of their child's mental states and their effects on behavior (e.g., *I sometimes misunderstand the reactions of my child*) (Luyten, Mayes, Nijssens, & Fonagy, under review; Slade, 2005, 2007). Concurrently, it is also important to consider difficulties in mentalization for parents. For instance, parents may struggle in recognizing and understanding that their child has a subjective inner world of thoughts and feelings (e.g., *My child's behavior is too confusing to even begin to understand*). For those parents who do not recognize their child's inner mind, evidence of pre-mentalizing may be in the form of malevolent attributions toward their child's mental states (e.g., *My child fusses just to annoy me*) as well as difficulties in recognizing their child's limited sense of self and behavior given their stage of development (e.g., *My child cries around strangers because she knows it embarrasses me*).

Understanding variability and difficulties with mentalization are important given the consequences for multiple child outcomes, including attachment security and social cognitive skills. Fonagy and colleagues (1991) reported that reflective functioning measured in parents prenatally predicted their children's attachment security at 12 and 18 months. Further, children's attachment security has been found to be associated with their performance on false-belief reasoning tasks – tasks that require an understanding of theory

of mind (Fonagy, Redfern, & Charman, 1997). Similar associations have been reported with respect to maternal mind-mindedness (i.e., the mother's recognition that their child has mental states), wherein higher levels of mind-mindedness were associated with children's attachment security at 12 months (Meins, Fernyhough, Fradley, & Tuckey, 2001) and their later performance on theory of mind tasks (Meins et al., 2002). This accumulating evidence suggests an important role for a parent's capacity to think about their child's mental states and how these mental states relate to behavior in children's developing attachment and social cognition. In considering the intergenerational transmission of attachment, Slade and colleagues (2005) reported that parental reflective functioning also mediated the relationship between parental attachment security and child attachment security postpartum. Consistent with these findings, data from a home-based mentalization intervention with maternal a sample suggested that infants in the intervention (vs. controls) were more likely to have a secure attachment and show less disorganization at one year of age (Sadler et al., 2013).

Parental reflective functioning has also been associated with overt parenting behaviors. For example, in a study that considered mothers with lower levels of reflective functioning, Grienenberger, Kelly, and Slade (2005) found higher levels of disruption to communications with their 10–14 month old infant during the Strange Situation procedure (Ainsworth, Blehar, Waters, & Wall, 1978). A similar finding has been reported where improvements in parenting behaviors in substance-using mothers have been observed in intervention efforts focusing on enhancing maternal reflective functioning, including mothers' increased sensitivity, contingent responding and promotion of socio-emotional and cognitive growth during interactions with their children (Suchman, Decoste, Castiglioni, Legow, & Mayes, 2008; Suchman, DeCoste, Castiglioni, et al., 2010). Taken together, these studies suggest that parental reflective functioning may play a critical role in parenting behavior and the developing child's attachment security, reflective functioning capacity and consequently their child's ability to regulate their emotions and navigate the social world.

We recently examined whether parental reflective functioning would be associated with tolerance of infant distress in a small pilot study (Rutherford et al., 2013). We wanted to assess whether this capacity was associated with the routine experience of many parents in needing to maintain a regulated state and soothe their crying child in the absence of any verbal indicators of the source of distress. To achieve this, mothers completed a baby simulator (BSIM) paradigm that required them to soothe a life-like crying baby simulator that, unbeknownst to them, was inconsolable. This task was designed to mirror other behavioral tasks developed to assess distress tolerance (Lejuez, Kahler, & Brown, 2003; Strong et al., 2003), enabling an ethically sensitive as well as ecologically valid approach to measuring tolerance of infant distress. We measured how long parents persisted in their attempt to soothe the BSIM, which continued to cry for a fixed period of time (20 minutes) unless the participant opted to finish the interaction early. Our main finding was that mothers reporting higher levels of reflective functioning – specifically in respect of interest and curiosity in their own infant's mental states – persisted for longer in soothing the BSIM. We also included a second distress tolerance task (the Paced Auditory Serial Addition Task, PASAT-C; (Lejuez et al., 2003), which measured persistence in a computer-based frustration task, unrelated to infants and the caregiving role. Parental reflective functioning was not associated with persistence times in this more generic task. Hence, these findings

suggested that parental reflective functioning might be specific to tolerance of infant distress, but not distress tolerance more generally when measured by persistence times. We also found that in a subset of this sample (*N*=15) where physiological recording was possible, heart rate and systolic blood pressure increased pre- to post-BSIM interaction, validating the distressing nature of the task.

The purpose of the present study was to replicate and extend these previous findings in a larger sample of mothers, employing multiple measures of distress tolerance and a more extensive examination of peripheral physiology during the BSIM interaction. Distress tolerance, as a component of affect regulation, is increasingly proving to be a valuable construct to parenting and family systems research. A recent report evidenced that maternal levels of distress tolerance (as measured by the PASAT-C) predicted adolescent daughters' level of distress tolerance, though this relationship was absent between maternal and adolescent son's distress tolerance levels (Daughters, Gorka, Rutherford, & Mayes, 2013). Notably, these distress tolerance findings fit with a broader literature that suggests parents may play a critical role in shaping the socialization and regulation of emotion in their children (Bariola, Hughes, & Gullone, 2012; Bridges, Denham, & Ganiban, 2004; Kopp, 1989; Thompson, 1994; Zeman, Cassano, Perry-Parrish, & Stegall, 2006).

Given the multifaceted nature of distress tolerance (Zvolensky, Vujanovic, Bernstein, & Leyro, 2010), self-report as well as behavioral measures have been designed to capture an individual's perception and tolerance of distress. Therefore, the present study advanced Rutherford et al. (2013) by employing the Distress Tolerance Scale (DTS; (Simons & Gaher, 2005) as well as including the PASAT-C. The DTS is a self-report measure that has been widely employed as the hallmark assessment of distress tolerance (Lejuez, Banducci, & Long, 2013). The DTS was designed to capture variability in four different components of distress tolerance: (1) self-perceived tolerance of distress and how bearable exposure to distress is; (2) appraisal and acceptability in the exposure to distress and how it can be handled; (3) employment of maladaptive regulation responses to avoid distress; and (4) the extent to which cognition and behavior are affected by being absorbed by distress. This multifaceted approach provides the opportunity for greater insight into the relationship between parental reflective functioning and different components of distress tolerance, rather than treating this phenomenon as single construct based on behavioral responding.

Although the DTS is a broadly applicable measure (i.e., it is not specific to parents or parenting-related situations), the addition of the DTS also provides the opportunity to investigate how mothers' perceive their tolerance of distress. This more interpersonal or self-reflective approach may be more sensitive in identifying associations between parental reflective functioning and distress tolerance than purely behavioral persistence measures. This potential for divergence between the DTS, BSIM and PASAT-C resonates with the weak associations typically reported in the literature between self-report and behavioral assessments of distress tolerance (McHugh et al., 2011). Thus, understanding whether parental reflective functioning is associated with all or some of these components of distress tolerance could have important implications for parenting interventions and our understanding of distress tolerance more generally. Specifically, intervention programs could be designed to precisely target the relevant components of reflective functioning and

distress tolerance in helping parents to manage their experience of negative affective states during caregiving interactions.

The goal of this study was to further examine the relationship between parental reflective functioning and tolerance of distress. As in our prior work, we assessed parental reflective functioning by employing the Parental Reflective Functioning Questionnaire (PRFQ) – a brief multidimensional assessment of parental reflective functioning designed for parents of young children (Luyten et al., under review). It is important to note that parental reflective functioning is typically measured using the Parent Development Interview (PDI; (Aber, Slade, Berger, Bresgi, & Kaplan, 1985; Slade, Bernbach, Grienenberger, Levy, & Locker, 2002) – a 60–90 minute semi-structured interview that asks parents to describe different interactions with their child. These descriptions are subsequently transcribed and coded to provide a single reflective functioning score drawn from across the interview. While this method provides rich and detailed parenting narratives, the training required for the implementation and scoring of this approach can affect its feasibility in studies of larger parent samples.

We asked mothers to complete both self-report (Distress Tolerance Scale) and behavioral (BSIM, PASAT-C) measures of distress tolerance. Further, we assessed whether measures of peripheral physiology obtained during the BSIM task were associated with the PRFQ and our distress tolerance measures. Our central hypotheses were (1) given the DTS may tap into individual differences in sensitivity to distress, including regulatory responding, that scores on the PRFQ would be associated with scores on the DTS; (2) given our previous findings, we predicted that the PRFQ would be associated with the BSIM paradigm (persistence times and physiological measures) but not with persistence times on the PASAT-C. Finally, we also examined the relationship between our self-report and behavioral measures of distress tolerance but made no specific hypotheses regarding potential associations given the inconsistencies reported between self-report and behavioral measures of distress tolerance in the literature (McHugh et al., 2011).

Methods

Participants

Sixty-two mothers (*M* age = 27 years, *SD* = 6 years) were recruited from the New Haven and surrounding community early during the postpartum period. The age of the mothers' youngest child varied from 3 to 10 months (*M* = 5 months, *SD* = 1 month). Twenty-seven women in the sample were first-time mothers. Self-reported ethnicity in the maternal sample was African American (n=33), Caucasian (n=11), Hispanic (n=7), Asian (n=1), Native American (n=1), Other (n=7) and two did not report. We employed maternal education as a proxy for socioeconomic status (Landi, Crowley, Wu, Bailey, & Mayes, 2012; Mayes & Bornstein, 1995). Mean education (in years) was 13 (range 10–20 years). Five participants did not complete high school and seven participants had graduate or professional degrees beyond college. Three participants did not report their level of education.

Measures

The Parental Reflective Functioning Questionnaire—The PRFQ (Luyten et al., under review[1]) is an 18-item questionnaire that assesses parental reflective functioning. It consists of items related to parental interest and awareness of their child's mental states and how these mental states may influence behavior. The PRFQ consists of three subscales, with each subscale consisting of 6 items: The first "Pre-mentalizing" subscale is designed to capture non-mentalizing modes and includes items such as "My child sometimes gets sick to keep me from doing what I want to do" and "When my child is fussy he or she does that just to annoy me". The second "Certainty" subscale contains items that assess the inability to recognize that mental states are not transparent; for instance, "I always know why my child acts the way he or she does" and "I can always predict what my child will do". The third subscale pertains to parental "Interest and Curiosity" surrounding mental states; for instance, "I like to think about the reasons behind the way my child behaves and feels" and "I am often curious to find out how my child feels". Each item on the PRFQ is rated on a 7-point likert scale, where "1" represents "strongly disagree" and "7" represents "strongly agree".

The PRFQ has good internal consistency across all subscales: Pre-mentalizing (α = .70), Certainty (α = .82) and Interest and Curiosity (α = .74). This three-subscale structure holds for mothers and fathers and has been replicated in two independent samples. Construct validity is evident from these subscales being associated with parental attachment, emotional availability, and parenting stress and distress as well as infant attachment status as assessed by the Strange Situation Procedure (Luyten et al., under review; Rutherford et al., 2013). Research is currently underway to examine concurrent validity between the PRFQ and PDI. Higher scores on each measure are indicative of higher levels of the relative component of reflective functioning.

The Distress Tolerance (DTS) Scale—The DTS (Simons & Gaher, 2005) is a 15-item questionnaire that assesses an individual's perception of their tolerance of distress, specifically emotional distress tolerance. Each item on the DTS is rated on a 5-point likert scale, where "1" represents "strongly agree" and "5" represents "strongly disagree", with lower scores on this measure being associated with poorer distress tolerance. The DTS consists of four subscales that capture (1) *tolerance* of distress, which refers to the inability to experience negative affect (e.g., "I can't handle feeling distressed or upset"; 3 items); (2) *appraisal* of distress, where low distress tolerance is evidenced by self-perceived/evaluated inadequacies in responding to negative affect (e.g., "My feelings of distress of being upset scare me"; 6 items); (3) rate of *absorption* by distress, which captures the level of preoccupation with distress which affects other cognition and behavior (e.g., "When I feel distressed or upset, all I can think about is how bad I feel"; 3 items); and (4) *regulation* efforts in response to distress, where lower tolerance of distress manifests as the avoidance of negative affect as a regulatory strategy, typically occurring as an immediate avoidance response to distress (e.g., "I'll do anything to avoid feeling distressed or upset"; 3 items). The DTS has good construct validity, internal consistency (α = .72–.82) and test-retest reliability (α = .61; Simons & Gaher, 2005).

[1]A copy of the PRFQ can be requested from the authors. Please contact: patrick.luyten@ppw.kuleuven.be or linda.mayes@yale.edu

Computerized Paced Auditory Serial Addition Task (PASAT-C)—The PASAT-C (Lejuez et al., 2003) is a widely employed behavioral measure of distress tolerance (Daughters, Lejuez, Kahler, Strong, & Brown, 2005; Daughters et al., 2009; Lejuez et al., 2003). During this task, numbers are sequentially flashed on a computer screen. Participants are instructed to add the currently presented number to the number that appeared previously and to make their response before the subsequent number is presented on the screen. For any incorrect responses or missed responses, a loud error tone is played. The PASAT-C consists of three levels that vary in the time between the presentations of each new number to increase the difficulty of the task: Level 1 consists of a 3 second latency between number presentations (3 minute duration), Level 2 consists of a 2 second latency between each number (5 minute duration), and Level 3 consists of a 1 second latency between number presentations (10 minute duration). Participants were informed that once the final level had started that they could terminate the task at any time. Distress tolerance is measured as the time participants persist with the task during the final level.

The Baby Simulator (BSIM) Paradigm—The BSIM paradigm (Rutherford et al., 2013) is designed to measure parental distress tolerance. A baby simulator was purchased from Realityworks (http://www.realityworks.com/infantsimulations/realcarebaby.asp), a company that produces baby simulators for parenting programs. The BSIM is made of soft vinyl, and cries, pre-recorded from a young infant, are emitted from within the BSIM. Although the crying is constant, there are cyclic bouts of cry for 255 seconds, separated by a 10 second period of silence. A laptop computer positioned in another room controls the BSIM wirelessly. The sex of the BSIM (girl, boy) was matched to the sex of the mother's youngest child by using gender appropriate outfits (pink, blue) and names (Kathryn, Sam). Ethnicity of the BSIM could be Caucasian, African American or Latino (3 simulators in total), matched as closely as possible to mother-infant ethnicity. If participants did not fall into these ethnic categories, the Latino BSIM was employed as in the previous study (Rutherford et al., 2013).

The procedure is similar to that previously described (Rutherford et al., 2013). The BSIM is brought into the room with the participant and placed in a high chair, accompanied by a series of props (including a rattle, feeding bottle, new diaper, changing pad, book, rubber duck, toy car keys, soft blocks, ball, stuffed bear, stuffed owl, and blankets). Participants were read standardized instructions describing the study as one that was interested in understanding more about how parents soothe distressed infants; they were told that the BSIM would respond just as a real infant would to voice, facial expressions, touches and handling. Mothers then watched a 2-minute demonstration between the Experimenter and BSIM. The BSIM emitted cries throughout this interaction, but stopped crying once the Experimenter presented it with a feeding bottle. A pre-defined setting was used where the presentation of a micro-chipped feeding bottle would synch with the BSIM and the crying would stop. This demonstration served to illustrate the task to mothers as well as to evidence that the BSIM would be soothed once the correct action was performed.

Participants were then left alone with the BSIM and a chime elicited by the BSIM signaled the beginning of the interaction. All participants were instructed that the task was to soothe the BSIM and to continue soothing behaviors until the cries stopped. They were also told

that they could stop the task at any point by ringing a bell left in the room. Participants were continually monitored through live video feed and were asked to orient toward the camera throughout the interaction. Maternal distress tolerance (measured in seconds) was calculated from the onset of the interaction when the BSIM elicited a chime to when the bell was rung signaling the end of the interaction. If the bell was not rung after 27 minutes (1620 seconds), the Experimenter terminated the interaction. Mothers were then fully debriefed and explicitly informed that the BSIM was inconsolable and performance during the task was not a reflection of child caring skills.

Procedure

Participants completed the PRFQ, DTS, and PASAT as part of a larger battery of measures assessing parenting prior to their completion of the BSIM paradigm. Mothers had their blood pressure taken using an Omron HEM-780 monitor immediately before and after completion of the BSIM paradigm. Approximately 10 minutes after being debriefed, a third blood pressure measure was taken to assess physiological recovery from the BSIM interaction.

Data Analysis

Data from three participants were excluded following their extreme outlier responses on the PRFQ as determined by boxplot analysis of the data. Specifically, 3 mothers scored more than 2.5 standard deviations from the mean on the PRFQ-pre-mentalizing subscale, indicating higher levels of pre-mentalizing. In respect of the physiological analyses, 3 participants did not have complete physiological measures and data from one participant was excluded from the analysis following box plot analysis yielded that they were outliers in respective of systolic and diastolic blood pressure measures. These latter participants were excluded only in the analyses that addressed physiological data. Under circumstances where data from any of the measures were non-normally distributed, non-parametric assessments (i.e., Spearman's correlations) were employed.

Results

PRFQ and Self-Report Measure of Distress Tolerance and Covariate Analysis

Descriptive statistics and zero-order correlations for the PRFQ, DTS and covariates are presented in Tables 1 and 2. Table 2 evidences negative correlations between (a) the DTS Tolerance subscale and maternal age, (2) the PRFQ-Certainty subscale and maternal age; and (3) the PRFQ-Certainty subscale and the DTS Regulation subscale and maternal education. There were no other associations between the potential covariates and the other PRFQ and DTS subscales. Notably, in Table 2, the PRFQ-Pre-mentalizing subscale was negatively correlated with the Tolerance, Absorption, and Appraisal subscales of the DTS. These associations were moderate to large in their effect size. All other associations with the PRFQ-Interest and Curiosity and PRFQ-Certainty and DTS were weak and not statistically significant. When controlling for maternal education and age in the PRFQ-Certainty and DTS Regulation analyses, the results remained weak and not statistically significant (r's < .20; p's > .15) and therefore did not change when adjusting for this covariate. Taken

together, these negative correlations indicate that higher levels of pre-mentalizing were associated with a decreased capacity for tolerating distress.

PRFQ and Behavioral Measures of Distress Tolerance: BSIM and PASAT-C

Persistence times to soothe the BSIM ranged from 112 to 1620 seconds *(M* = 908 seconds; *SD* = 513 seconds or *M* = 15 minutes; *SD* = 9 minutes). Forty-eight mothers terminated the task early; 11 mothers continued until the experimenter terminated the interaction. Persistence times in the PASAT-C ranged from 1 to 600 seconds *(M* = 211 seconds; *SD* = 235 seconds or *M* = 4 minutes; *SD* = 4 minutes). Forty-six mothers terminated the task early; 13 mothers continued until the experimenter terminated the interaction. Of the 11 mothers that persisted for the full amount of time on the BSIM, 6 of these also persisted the full amount of time on the PASAT-C. Consistent with our past study, persistence on the PASAT-C and BSIM were only weakly correlated, $r(59) = .10$, $p = .47$.

Table 2 evidences that performance on these distress tolerance behavioral tasks were not associated with the maternal covariates. The correlations between PASAT-C and BSIM persistence as compared to each PRFQ subscale are presented in Table 2. While there were only weak associations between the PRFQ and PASAT-C, there was a moderate and statistically significant negative correlation between the PRFQ-Pre-mentalizing subscale and persistence on soothing the BSIM. Specifically, higher levels of pre-mentalizing were associated with terminating the task sooner (i.e., decreased persistence times). Further, the level of PRFQ-Pre-mentalizing between the 11 mothers who persisted for the entirety of the BSIM ($M = 1.27$; $SD = 0.39$) was less than the 11 mothers who terminated the task the fastest ($M = 1.68$, $SD = 0.54$), $t(20) = 2.04$, $p = .05$. All other associations between the PRFQ-Interest and Curiosity and the PRFQ-Certainty subscales with the BSIM were weak and not statistically significant. Given the potential relationship between maternal age and education and the PRFQ-Certainty subscale, when we repeated the analysis between the BSIM and PASAT-C and this PRFQ-Certainty subscale, controlling for these maternal variables, the associations remained weak and not statistically significant (r's $< -.14$, p's $>.29$).

Next we examined whether persistence on the PASAT-C and BSIM were associated with the DTS. As shown in Table 2, persistence in soothing the BSIM was positively correlated with the DTS-Regulation subscale, representing a moderate effect size. Thus participants who were more likely to engage in strategies to avoid distress (i.e., decreased capacity to regulate in the face of distress) were more likely to terminate the BSIM task sooner (i.e., decreased persistence times). We saw a similar pattern between the BSIM and DTS-Regulation when controlling for maternal education, $r = .27$, $p=.05$. All other associations between the DTS and our behavioral measures of distress tolerance were weak and not statistically significant (irrespective of controlling for maternal education; r's $< .06$, p's $>.68$).

PRFQ, DTS and BSIM Peripheral Physiology

We next examined parental reflective functioning and distress tolerance as it related to peripheral physiological assessments before and after the BSIM. Mean blood pressure and

heart rate before the BSIM interaction was 115/81 and 67.96 respectively. Immediately following the BSIM interaction, mean blood pressure and heart rate was 117/79 and 67.98, respectively. Approximately ten minutes after the BSIM interaction mean blood pressure and heart rate was 118/81 and 68.00, respectively. A repeated measures ANOVA for each of these physiological measures examining changes over time (3 levels: pre-BSIM, post-BSIM, 10 minutes post-BSIM) showed only an effect for systolic blood pressure, $F(2,110) = 3.73$, $p = .03$, with diastolic blood pressure, $F<1$, and heart rate, $F<1$, remaining unchanged across the course of the interaction. Therefore we examined only systolic blood pressure as it related to our variables of interest. Table 2 shows that systolic blood pressure at each time point of the BSIM was negatively associated with the PRFQ-Interest and Curiosity subscale. Specifically, higher levels of Interest and Curiosity were associated with lower systolic blood pressure before, during and after the BSIM interaction. However, it is important to note that maternal age and education were associated with systolic blood pressure and, when controlling for these factors, the association between the PRFQ-Interest and Curiosity subscale and systolic blood pressure became weak and statistically non-significant (r's < −.23, p's >.11).

Table 2 reports that systolic blood pressure at each time point of the BSIM was moderately to strongly associated with DTS-Tolerance, such that a greater capacity to tolerate distress was associated with a reduction in systolic blood pressure throughout the procedure. Importantly, when controlling for maternal age and education (Table 2), the relationship between DTS-Tolerance and systolic blood pressure remained statistically significant at the final time point (T3), $r=-.36$, $p=.01$, but was weaker prior to the interaction (T1) $r=-.25$, $p=.08$, and immediately after the BSIM interaction (T2), $r=-.19$, $p=.17$. Thus, greater capacity to tolerate distress was most robustly associated with lower systolic blood pressure at the recovery period following the BSIM interaction.

Discussion

Parental reflective functioning may be a critical faculty in the transition to parenthood that promotes sensitive and adaptive caretaking behavior (Slade, 2005, 2007). However, there is a paucity of research that has examined the relationship between parental reflective functioning and specific components of affect regulation in parents. A previous pilot study suggested a preliminary relationship between parental reflective functioning and distress tolerance (Rutherford et al., 2013), and this study extended this investigation by including a larger sample size of mothers and a more comprehensive assessment of distress tolerance and peripheral physiology. Specifically, we investigated the relationship between three core components of parental reflective functioning (i.e., interest and curiosity in mental states, recognition of the opacity of mental states, and pre-mentalizing), different aspects of tolerance of distress (perceived and experienced) and peripheral physiology. While an independent line of work has examined normal and clinical variations in distress tolerance as a component of affect regulation (Leyro, Zvolensky, & Bernstein, 2010; Zvolensky et al., 2010), its role in parenting research is relatively recent but represents a promising direction for future research (Daughters et al., 2013; Rutherford, Goldberg, Luyten, Bridgett, & Mayes, 2013).

Our principal findings were that levels of pre-mentalizing were negatively correlated with persistence times on our BSIM distress tolerance task and the Distress Tolerance Scale (DTS; (Simons & Gaher, 2005) measures of (1) general tolerance of distress; (2) absorption by feelings of distress, and (3) appraisal and acceptability of being distressed. These findings converge to suggest that higher levels of pre-mentalizing in the parenting role may be associated with mothers' persistence behavior in the presence of infant distress and mother's self-awareness of their own tolerance of distress. This potential relationship between pre-mentalizing and distress tolerance may manifest in parenting contexts where mothers prone to pre-mentalizing about their infants' emotions may be less able to tolerate infant affective signals of distress, and struggle with accepting and managing the experience of distress to the extent that it interferes with caregiving behavior. These findings support the necessity of mentalization-based interventions that help parents adopt a reflective stance during interactions with their infants - this may serve to both facilitate sensitive and responsive caregiving as well as help mothers maintain a well-regulated state (Slade, 2007).

Critically, we only found a weak relationship between parental reflective functioning and the PASAT-C. Unlike the other measures employed here, the PASAT-C is a non-social task, unrelated to parenting, and required no assessment of self in relation to perceived distress tolerance. Further, we found no relationship between the BSIM and the PASAT-C, or the DTS and the PASAT-C. Given the complexity of the task in requiring rapid calculation and responding, the PASAT-C may be tapping a more cognitive level of frustration or distress that is distinct from more social-based measures of distress tolerance potentially explaining this discrepancy. Therefore these findings suggest an important distinction when investigating the relationship between reflective functioning and distress tolerance in parenting samples: these relationships may only be observed when these constructs are measured in a social or interpersonal domain. Such a proposal would fit with the presumed multifaceted nature of distress tolerance (Zvolensky et al., 2010), and are informative to the discussion of why self-report and behavioral measures may capture different components of distress tolerance given the variability in the cognitive and social focus of these tasks (McHugh et al., 2011).

In understanding the relationship between pre-mentalizing and distress tolerance within a social and interpersonal domain, stress and distress is thought to have a detrimental impact on the capacity to mentalize, especially if the stress is interpersonal in nature. Stress and heightened arousal may inhibit the engagement of cortically-controlled processes of explicit mentalization that underscore reflection and reasoning when engaged with others (Fonagy & Luyten, 2009). A recent neuroimaging study converges with this notion in finding that the nature of the stressor (interpersonal vs. non-interpersonal) significantly impacted the recruitment of brain regions involved in mentalizing (Nolte et al., 2013). However, it is also important to consider the potential bi-directionality of these findings wherein impairments in mentalizing may be associated with increasing distress. For instance, difficulties in the detection and interpretation of infant affective signals and their association with infant's behavior could also increase frustration or distress for mothers. This notion resonates with a broader literature considering the bidirectional nature of cognition and emotion interactions (Ochsner & Phelps, 2007) and suggests caution in the interpretation of the directionality of these data. Nevertheless, these findings suggest that there may be a dissociation between the

capacity to mentalize and stress and distress, depending upon the interpersonal and social nature of the measures employed – an important assertion that could be empirically tested by varying the interpersonal components of different measures in future research.

We found no evidence of an association between the other subscales of the PRFQ and our measures of distress tolerance. However, our prior work reported a positive correlation between parent's interest and curiosity in their infant's mental states and distress tolerance as measured by the BSIM (Rutherford et al., 2013). In addition to the sample size difference between the two studies, a second relevant factor may explain this apparent distinction. Namely, mothers in the original study were enrolled with an infant younger than the age of 2 years (M = 13 months); however in the present study, we recruited mothers earlier in the postpartum period (M = 5 months). This difference in findings may tentatively suggest that the relationship between parental reflective functioning and distress tolerance may vary across the postpartum period. While infant age did not emerge as a covariate in the current analyses, there was a restricted age range in the present study (SD = 1 month), which may limit the influence of this variable. Any potential postpartum period influence may suggest a more developmental trajectory of mentalization in the emerging dyadic relationship, where parents first learn to recognize signals from their infant before interpreting and understanding these signals (Rutherford & Mayes, 2011). In other words, parents of younger children may be challenged to recognize signals from their infants and those who tend toward more pre-mentalizing modes of functioning are more likely to find cries and other communicative signals potentially confusing and more distressing. Such a notion highlights the importance of mentalization-based interventions across the postpartum period.

In respect of physiological measures and reflective functioning, we found that systolic blood pressure (SBP) measured before and after the BSIM was negatively correlated with mother's levels of interest and curiosity in their infant's mental states. Given that this PRFQ subscale was associated with SBP before as well as after the BSIM interaction, this finding may suggest that mothers' capacity to mentalize about their children's mental states may be associated with a more general physiological arousal state – with increasing arousal decreasing the capacity to mentalize. On the other hand, it is also important to consider that mothers increasing interest and curiosity in their child's mental states may act as a buffer or down-regulate stress. Critically, it is important to note that these relationships between mother's levels of interest and curiosity and SBP were weak and not statistically significant when controlling for maternal age and education. Therefore these findings should be considered in light of the contribution of these maternal covariates and their influence on the relationship between parental reflective functioning and measures of peripheral physiology.

The BSIM was designed to assess parenting-specific distress tolerance. Here we found that BSIM persistence times were associated with scores on the DTS regulation subscale. This subscale consists of items that relate to the use of regulation strategies to avoid sources of distress. Thus, women who self-reported their increased use of strategies to avoid distress terminated the BSIM task early. Notably, this employment of strategies does not reflect an adaptive strategy, such as cognitive reappraisal, but instead reflects active avoidance of distress (e.g., "I'll do anything to stop feeling distressed or upset"). SBP measured before (T1) and after (T2, T3) the BSIM was consistently associated with the DTS tolerance

subscale: mothers with lower levels of SBP before and after the BSIM interaction reported an increased ability to tolerate distress. Given the non-specificity of this effect, it is likely that this DTS subscale captures more generalized physiology, rather than being associated specifically with the BSIM. Nevertheless caution with this finding is warranted as the association between SBP and DTS tolerance was attenuated when controlling for maternal covariates of education and age.

In the present study we sought to further investigate the relationship between parental reflective functioning and distress tolerance. However, these findings should be considered in light of their limitations and additional directions for future research. Our findings speak to an important relationship between pre-mentalizing and distress tolerance early postpartum. However, it will be important to investigate the dynamic nature of parental reflective functioning and distress tolerance across the postpartum period. This would serve to rectify the apparent differences in the component (pre-mentalizing vs. interest and curiosity) of parental reflective functioning that relate to distress tolerance between this current study and our pilot work (Rutherford et al., 2013), and the potential change of this relationship across the duration of the postpartum period. Such an understanding would prove important therapeutically to identify optimal periods for mentalization-based interventions. Given data from human (Kim et al., 2010) and animal (Olazábal et al., 2013) studies that there is significant maternal neurobiological reorganization during the postpartum period, it is plausible that these structural changes may shape maternal cognition and behavior, and suggest potential periods optimal for receipt of intervention in at-risk mothers.

A limitation of this work is the absence of a more general measure of reflective functioning. This would serve to determine whether the findings reported here reflect the capacity of parents to mentalize for both themselves as well as their child, or if there is a special relationship between parental reflective functioning and tolerance of distress. Clinically, it has been reported that focusing on a mother's capacity to mentalize about herself may be an important starting point for interventions designed to improve parent-child interactions (Suchman, DeCoste, Leigh, & Borelli, 2010). Examining whether there is a differential contribution of general (i.e., mentalizing about the self) and parental reflective functioning to distress tolerance would further add to this clinical discussion. This may be possible through employing the PRFQ and conducting a re-analysis of the items. This approach has been successfully implemented with the PDI, evidencing a two-factor solution of parents' mentalizing about the self and mentalizing about the child (Suchman, DeCoste, Leigh, et al., 2010). Given the value of a self-report measure of reflective functioning when working with larger maternal samples, we did not employ the PDI in this study. Nevertheless, it is important to be cautious in the reliance on self-report measures - they may be limited due to reporting biases and the potential for decreased richness and quality of the data provided.

We also did not include an assessment of infant temperament. Therefore we do not know whether soothing the inconsolable BSIM reflects mother's own caregiving context of soothing their distressed and dysregulated infant and the familiarity of situations of inconsolable distress. This will be important to capture in respect of both self-report measures as well as observational parent-child interaction studies in future research to

determine how experience of infant distress may shape distress tolerance (and parental reflective functioning). Further, to more fully understand the relationship between reflective functioning and distress tolerance, examining the extent to which exposure to distress affects the capacity to mentalize in a parenting context would be valuable, particularly when infants are inconsolable. Concurrently, understanding whether other life stressors may shape reflecting functioning and distress tolerance when caregiving could also prove valuable in identifying the components of the dyadic relationship that may be challenging to mothers, and tailoring parenting interventions accordingly. We also did not examine the potential for individual differences related to attachment or psychopathology. It will be important to characterize potential moderators and mediators of the relationship between parental reflective functioning and distress tolerance in future work.

In summary, we investigated the relationship between parental reflective functioning and distress tolerance in a sample of recent mothers. We found pre-mentalizing was negatively correlated with behavioral and self-report assessments of distress tolerance. Further, we present evidence for the first time of a potential relationship between parental reflective functioning, as well as distress tolerance, and measures of peripheral physiology. These findings are important theoretically in advancing our understanding of reflective functioning and affect regulation, as well as therapeutically in the design and implementation of parenting intervention programs that employ a mentalization-based approach.

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Highlights

- Parental reflective functioning (RF) may support adaptive parenting behavior
- Preliminary data suggests parental RF is associated with distress tolerance (DT)
- Parental RF was examined as a function of multiple measures of DT
- Pre-mentalizing was consistently associated with lower levels of DT
- Findings confirm the relationship between RF and DT in recent parents

Table 1

Descriptive statistics for the PRFQ and DTS scales (N=59).

	M	SD	Range
DTS-Tolerance	3.47	1.05	1.33–5.00
DTS-Absorption	3.74	1.10	1.33–5.00
DTS-Appraisal	3.70	0.94	1.67–5.00
DTS-Regulation	2.70	0.93	1.00–5.00
PRFQ-Pre-mentalizing	1.49	0.55	1.00–3.33
PRFQ-Interest & Curiosity	5.73	0.94	2.5–7.00
PRFQ-Certainty	3.89	1.13	1.00–6.17

DTS Distress Tolerance Scale; PRFQ Parental Reflective Functioning Questionnaire; M Mean; SD Standard Deviation

Table 2

Correlation coefficients between maternal covariates (Items 1–4), Measures of parental reflective functioning and distress tolerance (5–13), and peripheral physiology (14–15).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Parity															
2 Maternal Age	.16														
3 Infant Age	−.02	.13													
4 Maternal Education	−.18	.16	−.17												
5 BSIM	.01	.02	.11	.26											
6 PASAT-C	−.08	−.11	−.19	−.05	.10										
7 PRFQ_Pre-Mentalizing	−.04	.04	.02	.08	−.31*	−.03									
8 PRFQ_Interest	−.19	−.06	.02	.20	.02	−.14	−.18								
9 PRFQ_Certainty	.11	−.26*	−.08	−.31*	−.11	.14	−.11	.16							
10 DTS_Tolerance	.02	−.27*	−.12	.04	−.01	.12	−.38**	.20	.25						
11 DTS_Absorption	.16	−.18	−.25	.06	.10	.03	−.49**	.11	.20	.73**					
12 DTS_Appraisal	−.01	−.11	−.17	.07	−.04	.05	−.42**	.20	.21	.76**	.73**				
13 DTS_Regulation	−.08	.16	.15	.26*	.36**	−.06	0.20	.06	−.12	.26*	.21	.32*			
14 T1 SBP	.17	.38**	.18	−.36**	−.01	−.16	.06	−.27*	−.09	−.28*	−.11	−.17	−.05		
15 T2 SBP	.13	.15	.06	−.35**	−.06	−.13	.03	−.30*	−.03	−.25	−.08	−.15	−.09	.83**	
16 T3 SBP	.24	.37**	.11	−.31*	.04	−.09	.11	−.38**	−.03	−.41**	−.21	−.23	−.22	.73**	.71**

* p<.05,

** p<.01