



## Parental reflective functioning is associated with tolerance of infant distress but not general distress: Evidence for a specific relationship using a simulated baby paradigm



Helena J.V. Rutherford\*, Benjamin Goldberg, Patrick Luyten,  
David J. Bridgett, Linda C. Mayes

Yale Child Study Center, Yale School of Medicine, University of Leuven, Northern Illinois University, Belgium

### ARTICLE INFO

#### Article history:

Received 10 January 2013  
Received in revised form 10 June 2013  
Accepted 27 June 2013  
Available online 30 July 2013

#### Keywords:

Parenting  
Motherhood  
Reflective functioning  
Mentalization  
Distress tolerance

### ABSTRACT

Parental reflective functioning represents the capacity of a parent to think about their own and their child's mental states and how these mental states may influence behavior. Here we examined whether this capacity as measured by the Parental Reflective Functioning Questionnaire relates to tolerance of infant distress by asking mothers ( $N = 21$ ) to soothe a life-like baby simulator (BSIM) that was inconsolable, crying for a fixed time period unless the mother chose to stop the interaction. Increasing maternal interest and curiosity in their child's mental states, a key feature of parental reflective functioning, was associated with longer persistence times with the BSIM. Importantly, on a non-parent distress tolerance task, parental reflective functioning was not related to persistence times. These findings suggest that parental reflective functioning may be related to tolerance of infant distress, but not distress tolerance more generally, and thus may reflect specificity to persistence behaviors in parenting contexts.

© 2013 Elsevier Inc. All rights reserved.

Parenthood represents a significant transitional stage in adulthood that is characterized by a number of psychological and neurobiological cascades of changes that facilitate adaptive and sensitive caregiving (Gonzalez, Atkinson, & Fleming, 2009; Rutherford & Mayes, 2011; Swain, 2011). These changes likely allow for the growth of critical faculties that support the emerging parent–child relationship. Understanding how the mind and brain are shaped by parenthood is important with long lasting implications for both parent and child development. Within this context, there is a growing body of research that has focused on the parent's capacity for reflective functioning, referring to the capacity to treat the infant as motivated by internal mental states, in explaining the intergenerational transmission of attachment and associated affect regulatory capacities. Yet, although research has convincingly demonstrated a relationship between parental reflective functioning and attachment in offspring (Fonagy, Steele, Steele, Moran, & Higget, 1991; Fonagy, Gergely, & Target, 2007; Sharp & Fonagy, 2008), there is less research on the role of parental reflective functioning and affect regulation, specifically in relation to infant distress. Therefore the purpose of this study was to investigate the relationship between parental reflective functioning and the capacity to tolerate infant distress in a group of recent mothers.

Mentalization or reflective functioning describes the capacity of an individual to recognize their own mental states, as well as the mental states of others (Fonagy, 1991; Fonagy, Gergely, Jurist, & Target, 2006). Mental states may include thoughts, feelings and intentions, as well as understanding the complexity and interplay of these mental states and their influence on behavior. This ability facilitates understanding of both self and other, allowing predictability in social interactions, the

\* Corresponding author at: Yale Child Study Center, 230 South Frontage Road, New Haven, CT 06520, USA. Tel.: +1 2037373408.  
E-mail address: [helena.rutherford@yale.edu](mailto:helena.rutherford@yale.edu) (H.J.V. Rutherford).

formation of social relationships, as well as effective navigation of the social world (Fonagy et al., 2006). Concurrently, encompassed in this definition of mentalization is the active interest in understanding mental states, recognition of the opacity of mental states, and the ambiguity and potential disguise of mental states in others.

By contrast, in circumstances where an individual is unable to mentalize, there may be evidence of pre-mentalization modes of thought; for instance, the belief that mental states accurately reflect reality (i.e., psychic equivalence) or that mental states are entirely separate from reality (i.e., pretend). Consequently, mentalization likely exists on a continuum, ranging from low to high levels. Individuals with low levels of reflective functioning may be unable to recognize even the crudest of mental states, whereas individuals with higher levels of reflective functioning can likely recognize and understand the complex and dynamic interplays of mental states and their influence on behavior.

The capacity to mentalize is of interest to parenting research when considering how parents respond to their infant's affective (and non-affective) signals during dyadic interactions. Early communication between the parent and their child is limited to a non-verbal level, and therefore parents interpret the infant's internal world through observation of their child's behavior and affective signals. Accordingly, while reflective functioning may represent a more generalized process, the capacity of a parent to think about their child's mental states based on these non-verbal signals likely represents a qualitatively different function (e.g., Luyten, Fonagy, Lowyck, & Vermote, 2012), which may become more refined through the emerging parent-child relationship (Slade, 2005). Furthermore, the capacity of parents to be aware of their own mental states and behavior at the same time they make room for understanding their infant's mental states and behavior is critical for sensitive and responsive caretaking. In mothers with lower levels of reflective functioning, there are increased disruptions in communication when interacting with their child (Kelly, Slade, & Grienenberger, 2005). For this reason, a number of intervention studies with families have chosen to focus on enhancing reflective functioning in parents to improve the parent-child relationship (Slade et al., 2005; Suchman, Decoste, Castiglioni, Legow, & Mayes, 2008), with increasing interest in infant mental states being central to parental reflective functioning (Slade, 2005). However, empirical investigation of the relationship between reflective functioning and affect regulation in parents has not previously been conducted.

Given the role of reflective functioning in how parents respond to their children's affective and non-affective signals, this capacity may have important implications for child development. For example, it has been proposed that effective mirroring of the infant's affect by their parent lays the foundation for attachment security, affect regulation, self-control, as well as the emergence of mentalization in the child (Fonagy et al., 2006). Consistent with this notion, Fonagy et al. (1991) found that prenatal reflective functioning in parents predicted their child's attachment security at 12 and 18 months. Thus, parental reflective functioning may help promote the emergence of attachment security as well as mentalization in the child, and suggests a potential route for the intergenerational transmission of mentalization from parent to child. Critically, if parents are unable to mirror their infant's emotions, or parental affective responses are not contingent to their infants' affective signals, this may significantly impact the infant's capacity to learn to represent emotion and self-regulate. Indeed, this difficulty may be observed in parent-child dyads where the parent is overwhelmed by negative affect in response to their infant's distress, and the increased levels of arousal may hinder their affective mirroring and reflective functioning capacity (Fonagy et al., 2006). Thus the importance of the parent to the child's emerging sense of self, self-regulation, and mentalization supports the necessity to study parental reflective functioning independently of other relationships (Slade, 2005).

Variability in parental reflective functioning may be related to the parent's capacity to maintain a well-regulated state while caring for their distressed infant. However, there has been little empirical work investigating parental capacity to tolerate infant distress. Independent lines of research have examined more generally the capacity of individuals to tolerate varying levels of physical and psychosocial distress in experimental settings. Heterogeneity in distress tolerance has been examined in both adolescent and adult samples, and is thought to be a factor in the emergence and maintenance of a number of clinical disorders (Leyro, Zvolensky, & Bernstein, 2010; Zvolensky, Vujanovic, Bernstein, & Leyro, 2010). Generally, a high capacity for distress tolerance is thought to be adaptive in managing stress; however, decreased levels of distress tolerance may be associated with more maladaptive responding to stress, including seeking opportunities to escape or avoid negative affect (e.g., addiction; Brown, Lejuez, Kahler, & Strong, 2002). Distress tolerance is relevant to parenting when considering a parent's persistence in soothing their distressed child. Parents may need to attempt multiple strategies over an extended period of time to provide relief to their dysregulated infant. Therefore, they will need to both maintain their own regulated state as well as seek to help soothe and regulate their infant. Consequently, a parent's capacity to mentalize may prove a critical factor in tolerating their infant's distress: fundamental to parental reflective functioning therefore is interest and curiosity in mental states, willingness and motivation to understand the mental states that underlie the child's behavior (including difficult behavior), and the absence of tendency to make malevolent attributions.

## 1. The current study

The central objective of this study was to examine whether parental reflective functioning was related to tolerance of infant distress. Parental reflective functioning was assessed by employing the Parental Reflective Functioning Questionnaire (PRFQ; Luyten, Mayes, Nijssens, & Fonagy, submitted for publication). The PRFQ is a multidimensional assessment of parental reflective functioning, suitable for mothers and fathers of young infants and children. The PRFQ was designed to lessen the burden of an interview and assesses parental reflective functioning across three domains: (1) capturing *parental interest and curiosity* in mental states, with the view that active involvement in understanding an infant's mental states evidences adaptive reflective functioning (Slade, 2007); (2) *certainty of mental states*; specifically assessing the parents awareness that

they are not always going to know what their child needs or wants; and (3) capturing of *pre-mentalizing modes* in parents that may disrupt the formation of secure attachment, affect regulation and mentalization in the infant.

To measure tolerance of infant distress, an ecologically valid laboratory-based parenting task was administered. In this task, parents were presented with a baby simulator (BSIM) that was computer-controlled to elicit cries for a fixed period of time unless the participant is able to successfully soothe the BSIM through caregiving behaviors. Unbeknownst to the participants, the BSIM was preprogrammed to be inconsolable and thus parenting distress tolerance was operationalized as the amount of time parents persisted in their attempts to soothe the BSIM during the task. To validate the stressful nature of this novel BSIM task, heart rate and blood pressure were assessed before and after the interaction, with increases in these measures consistent with increased stress reactivity (e.g., Linden, Earle, Gerin, & Christenfeld, 1997).

We hypothesized that if the capacity to mentalize facilitates tolerance of distress, higher levels of parental reflective functioning should be related to longer persistence times with the BSIM. Importantly, this hypothesis was driven by the notion that parental reflective functioning is specific to affect regulation within the parent–child relationship, and does not represent a capacity of affect regulation more generally under conditions of distress. However, this notion has not previously been addressed in the literature. Therefore, we also administered a non-parenting distress tolerance task, the paced auditory serial addition task (PASAT-C; (Lejuez, Kahler, & Brown, 2003)). The relationship between the PRFQ dimensions and PASAT-C persistence times were also examined to address specifically whether parental reflective functioning facilitates parenting specific distress tolerance, or tolerance of distress more generally.

## 2. Methods

### 2.1. Participants

Prior to recruitment, the Human Investigations Committee at Yale School of Medicine approved all procedures. Twenty-one mothers ( $M = 30$  years;  $SD = 6$  years; *Range* 19–42 years) were recruited from the New Haven community as part of a larger study of maternal distress tolerance. Mothers had to have at least one child under the age of 2 years to participate and all mothers received \$40 reimbursement for their participation. Our sample consisted of primiparous ( $n = 12$ ) and multiparous ( $n = 9$ ) mothers. All were the biological mothers of their children. Maternal ethnicity was African American not of Hispanic Origin ( $n = 4$ ), White not of Hispanic Origin ( $n = 9$ ), Hispanic or Latino ( $n = 2$ ), and 6 mothers did not report their ethnicity or reported it as unknown. Ten mothers reported being married, 6 were single, 2 had a life partner, 2 were separated or divorced, and one mother did not report their marital status. No psychiatric diagnostics assessments were included although mothers completed self-report measures of depression (Beck, Steer, & Brown, 1996) and anxiety (Beck & Steer, 1990). Mothers reported minimal depression symptomatology ( $M = 7.62$ ;  $SD = 5.90$ ) and moderate anxiety levels ( $M = 26.35$ ;  $SD = 7.69$ ). These symptoms were unrelated to parental reflective functioning and distress tolerance measures and thus were not included in further analyses as covariates.

### 2.2. Measures

#### 2.2.1. Parental Reflective Functioning Questionnaire (PRFQ)

The P PRFQ is an 18 item questionnaire<sup>1</sup> consisting of three subscales that asks participants to rate a series of statements relevant to their child that assess curiosity surrounding mental states, efforts to understand mental states and how they relate to behavior, and refusal to acknowledge mental states and their influence on behavior. Each item on the PRFQ is rated on a 7-point likert scale, where “1” represents “strongly disagree” and “7” represents “strongly agree”. The pre-mentalizing subscale consists of items designed to capture non-mentalizing modes that include “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 certainty of mental states subscale consists of items designed to capture the inability to recognize that mental states are not transparent. Items include “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 is designed to capture the interest and curiosity a parent has in their child’s 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”.

Exploratory and confirmatory factor analysis to support the three factor structure of the PRFQ has been replicated in two different samples, and holds for both mothers and fathers. The PRFQ has good internal consistency with  $\alpha = .70$  for pre-mentalizing,  $\alpha = .82$  for certainty in mental states, and  $\alpha = .74$  for interest and curiosity in mental states. The subscales are not, or only modestly, related to demographic features, and are in theoretically expected ways related to parental attachment, emotional availability, and parenting stress (Luyten et al., submitted for publication).

#### 2.2.2. The Baby Simulator (BSIM) Paradigm

In the current study, a baby simulator was obtained from Realityworks (<http://www.realityworks.com/infantsimulations/realcarebaby.asp>), a company that produces baby simulators for parenting programs, to examine parental response to infant

<sup>1</sup> A copy of the PRFQ can be requested from the third and fifth authors, please contact: [patrick.luyten@ppw.kuleuven.be](mailto:patrick.luyten@ppw.kuleuven.be) or [linda.mayes@yale.edu](mailto:linda.mayes@yale.edu).

distress in a controlled fashion. 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 25 s, separated by a 10 s 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).

### 2.2.3. Computerized Paced Auditory Serial Addition Task (PASAT-C)

A standardized general distress tolerance task, the PASAT-C (Lejuez et al., 2003), was administered to examine whether parental reflective functioning would be related to distress tolerance in a non-parenting domain. The PASAT-C has been employed widely in adult and adolescent samples to reliably increase affective distress (Daughters, Lejuez, Kahler, Strong, & Brown, 2005; Daughters et al., 2009; Lejuez et al., 2003). In this task, numbers are sequentially flashed on a computer screen, and participants are asked to add the currently presented number to the previously presented number, before the subsequent number appears on the screen. A loud error noise accompanies any miscalculations or missed responses. The task has three levels with varying latencies between number presentations. The first level provides a 3 s latency between number presentations (low difficulty), a 2 s latency during the second level (medium difficulty), and a 1 s latency during the final level (high difficulty). The first level lasts for 3 min and the second level lasts for 5 min. Following a 2 min rest period, the final level continues for up to 10 min (600 s), with the participant having a termination option. Participants were informed that once the final level had started that they could terminate exposure to the task at any time. Distress tolerance was indexed as latency in seconds to task termination during completion of the final level of the task.

### 2.2.4. Procedure

Following completion of the PRFQ and PASAT-C, as well as additional questionnaires and tasks that form part of a larger parenting study, the BSIM was brought into the room and placed in a high chair, accompanied by a series of props (including a rattle, feeding bottle, new diaper, book, and blanket). 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 2.5 min 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 20 min (1200 s), 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 their child caring skills.

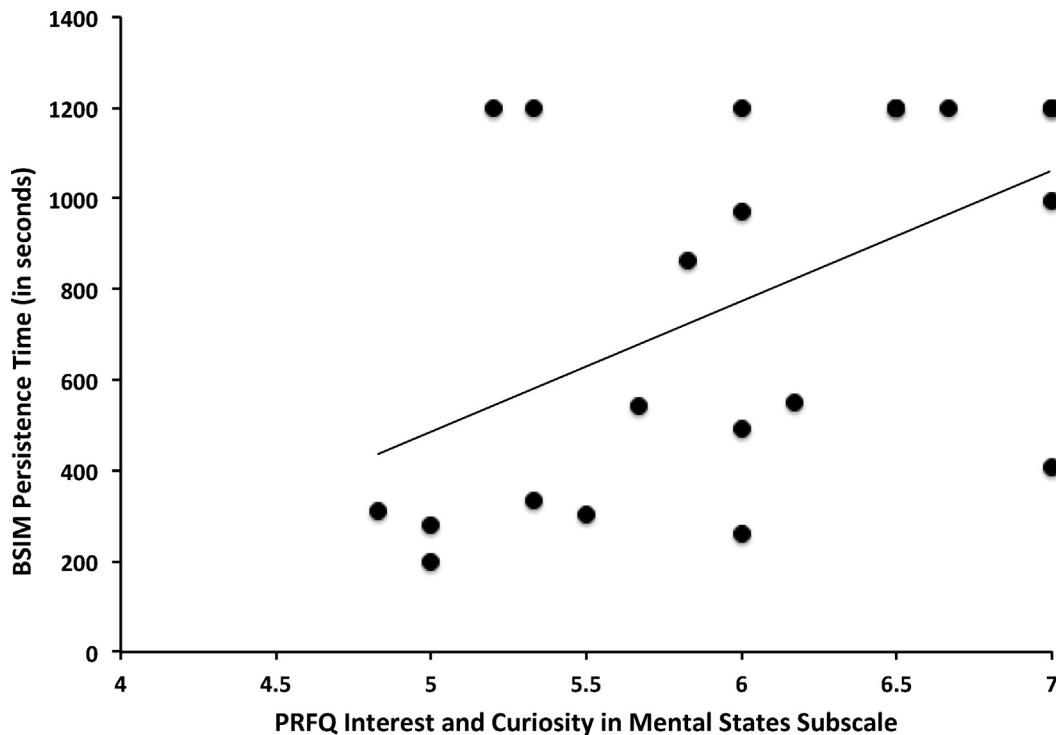
To assess the stressful nature of the interaction, mothers had their blood pressure and heart rate taken immediately before and after completion of the interaction (this was only successfully achieved in 15 out of 21 mothers). Blood pressure and heart rate were recorded using an Omron HEM-780 blood pressure monitor.

## 3. Results

### 3.1. Data analysis

Systolic and diastolic blood pressure values, as well as persistence times for the BSIM and PASAT-C, were not normally distributed and therefore non-parametric tests were used for the analysis of these variables. Specifically, Spearman's rho ( $r_s$ ) correlations were conducted to examine the relationship between PRFQ scores and performance on the BSIM interaction and PASAT-C. Wilcoxon Signed Rank Tests were used to assess any changes in blood pressure pre- and post-BSIM interaction. Although there was a small sample size of primiparous and multiparous mothers, breakdown of performance on the BSIM,  $z = -1.68$ ,  $p = .09$  and PASAT,  $z = -1.04$ ,  $p = .30$ , were unaffected by parity. Moreover, parity did not differentiate mothers on any of the subscales of the PRFQ,  $t$ 's  $< 1.43$ ,  $p$ 's  $> .17$ .

The manipulation check of the BSIM paradigm by measures of peripheral physiology was successful in demonstrating mild changes associated with stress reactivity following completion of the interaction (Linden et al., 1997). In participants with physiological data ( $n = 15$ ), mean blood pressure before the BSIM interaction was 116/83 and after the interaction was 127/84. This represented a statistical increase in systolic,  $z = 3.15$ ,  $p = .002$ , but not diastolic,  $z = 1.13$ ,  $p = .26$ , blood pressure, suggesting increased stress reactivity. Heart rate was on average 66 beats per minute (BPM) before the interaction, and increased to 69 BPM after the interaction,  $t(14) = -2.44$ ,  $p = .03$ , also supporting the increasing stress response to the BSIM.



**Fig. 1.** Parental Reflective Functioning Questionnaire (PRFQ) Interest and Curiosity in Mental State subscale scores and persistence times in soothing the Baby Simulator (BSIM; maximum persistence time = 1200 s).

### 3.2. Persistence times

Persistence times to soothe the BSIM ranged from 199 to 1200 s ( $M = 767$  s;  $SD = 409$  s or  $M = 13$  min;  $SD = 7$  min). Thirteen mothers terminated the task early whereas 8 mothers continued until the Experimenter terminated the interaction, suggesting the BSIM was successful in producing heterogeneity in persistence times. In the PASAT-C, persistence times ranged from 17 to 600 s ( $M = 316$  s;  $SD = 266$  s or  $M = 5$  min;  $SD = 4$  min). Twelve mothers terminated the PASAT-C early (4 of these mothers also terminated the BSIM interaction); 9 mothers completed the full task. Persistence times in the BSIM interaction and PASAT-C were only weakly correlated,  $r(21) = .23$ ,  $p = .32$ .

### 3.3. Parental reflective functioning and persistence times

As can be seen in Fig. 1, there was a large positive correlation between the PRFQ Interest and Curiosity in Mental States subscale and persistence times with the BSIM,  $r_s(21) = .51$ ,  $p = .02$ , explaining approximately 26% of the shared variance. Further, BSIM persistence times were negatively, although not significantly, related, to the PRFQ Pre-mentalizing,  $r_s(21) = -.12$ ,  $p = .61$ , and PRFQ Certainty,  $r_s(21) = -.14$ ,  $p = .53$ , subscales. PASAT-C persistence times did not correlate with any of the PRFQ subscales,  $r_s' < .14$ ,  $p$ 's  $> .53$ .

## 4. Discussion

Mentalization and reflective functioning refer to the capacity of an individual to understand their own mental states, the mental states of others, and how mental states may influence behavior (Fonagy, 1991). Recent work suggests becoming a parent may shape this capacity, where the interpretation of infant mental states is uniquely driven by non-verbal signals expressed by the infant. These signals, especially when distressing in nature, require the parent to maintain an affective state to facilitate regulatory processes and soothe their child (Fonagy et al., 2006; Slade, 2005). Caring for an infant may place significant demands on the parent, and this may be most evident when infants are dysregulated, requiring increased self-regulation and interpretation of mental states and expressed behavior on behalf of the parent. Indeed, one of the challenges facing parents is to remain regulated in the presence of infant distress, so they can respond sensitively and appropriately to their infant's affective signals (Slade, 2005). Mentalization may be a critical faculty underscoring adaptive and responsive caregiving for parents, with higher levels of mentalization allowing for increased self-regulation in response to infant affect. To test this hypothesis, in the present study mothers were asked to soothe an inconsolable baby simulator (BSIM) and their persistence times in soothing attempts was correlated with parental reflective functioning as opposed to a

non-attachment-related persistence task. The noteworthy finding was the positive relationship between the PRFQ subscale of interest and curiosity and persistence times, evidencing that increased levels of interest and curiosity, a core feature of parental reflective functioning (Slade, 2005, 2007), was associated with increased persistence times with soothing the BSIM. Hence mothers scoring higher in their interest toward their child's mental states persisted for longer in soothing the infant simulator. Concurrently, none of the parental reflective functioning dimensions correlated with persistence times on the non-parenting distress tolerance task, the PASAT-C, suggesting that parental reflective functioning is specific to attachment-related persistence behavior, but does not tap into a more general capacity for persistence.

Our finding that interest and curiosity in mental states relates to infant distress tolerance resonates with the notion that an active interest in mental states is illustrative of adaptive mentalization (Slade, 2007). This suggests participants adopt a reflective stance that may facilitate dyadic interactions when infants are in distress, allowing the parent to regulate their own state while engaging in multiple soothing behaviors over time with their infant. The absence of a relationship between the certainty and non-mentalizing subscales is also of interest as this suggests that these elements of mentalization may be differentially related to, or independent of, tolerance of infant distress, at least in the simulated parenting paradigm that was adopted here. It may be that these dimensions of mentalization are less relevant to the context of a persistence-based infant distress tolerance task than the dimensions of interest and curiosity. Alternatively, the scores on these subscales were drawn from a community sample, and research in at-risk parents may show different results that may speak to more malevolent attributions of mental states that may hinder parent's affect regulation in attachment-based contexts. This latter interpretation would be congruent with the trend toward negative correlations between these subscales and persistence times in the present study, an effect which may be seen more readily in clinical samples where these attributions may be more extreme.

These results, that increased reflective functioning may be related to heightened tolerance of infant distress, further highlight the importance of reflective functioning as a capacity that may affect the quality of the parent-child relationship (Fonagy et al., 2006; Kelly et al., 2005; Slade, 2005, 2007). For this reason, enhancing parental reflective functioning has been a central construct to parenting interventions, where increases in reflective functioning have been associated with improvements in caregiving behavior (Slade et al., 2005; Suchman et al., 2008; Suchman, DeCoste, Castiglioni et al., 2010). These programs typically work by training parents to (1) recognize mental states of themselves and others; (2) understand how mental states can influence behavior and other mental states; and (3) over time recognize and understand the interplay of mental states and behavior between individuals (Slade, 2007). Such an approach encourages parents to take a reflective stance in thinking about their child's mental states rather than focusing only on their expressed behavior. However it should be noted that from this intervention work, two components of parental reflective functioning have emerged: (1) the parent's mentalization capacity about their own emotions and how they influence their child; and (2) the parent's mentalization capacity for their child's feelings and how they impact their own mental states and behavior (Suchman, DeCoste, Leigh, & Borelli, 2010). While the findings from the present study may speak more readily to parent's faculty of child-focused reflective functioning, future work can extend these findings by including an assessment of parental self-reflective functioning and its relationship to tolerance of infant distress (and distress more generally).

In measuring tolerance of infant distress and the relationship to parental reflective functioning, a simulated parenting situation was employed. This was advantageous in allowing the characteristics of the infant to be held constant, and was an ethically sensitive measure to assess parental responding to infant distress in the laboratory. Few other studies have employed infant manikins to explore parenting behavior under controlled conditions that can be held constant across participants (see Gustafson & Harris, 1990 for another example), and this represents a novel direction for parenting research. Our finding that physiological markers of stress reactivity (blood pressure, heart rate) increased following the interaction converges with the notion that the BSIM paradigm is distressing in nature, and our ongoing research is examining this paradigm in normative and clinical samples of parents and non-parents (e.g., Amador, Mayes, & Rutherford, 2012).

Although these findings are the first to demonstrate a relationship between parental reflective functioning and tolerance of infant distress, the present study needs to be considered in light of its limitations. While the BSIM was employed as a distress tolerance task, the temperament of the mother's own infant was not assessed and the task itself may not resonate with the experiences of the mother outside of the laboratory. Moreover, only a measure of parental reflective functioning was included, and while this correlated with persistence time with the BSIM, having a more general assessment of reflective functioning (e.g., Fonagy, Steele, Steele, & Target, 1998) may have demonstrated a relationship to performance on the PASAT-C, as well as served to evaluate the differences in general and parenting-specific reflective functioning. It is also worth noting that there are a number of parenting individual differences that may influence parental reflective functioning and tolerance of infant distress that need to be considered in future work. This would include taking into account the parent's own attachment style and how this relates to parenting behavior; for instance, does a history of severe attachment disruptions lead parents to function in more prementalizing modes with their children? Cognitive factors may also play a role, including cognitive affect regulation strategies and executive functions: one recent study reported that parents with poorer working memory capacity evidence higher levels of reactive negativity toward their children during a frustration-based cooperation task (Deater-Deckard, Sewell, Petrill, & Thompson, 2010). Critically, this approach considers how these measures may impact the relationship between parental reflective functioning and distress tolerance; however, it would also be valuable to explore whether reflective functioning mediates and/or moderates the relationship between these other parenting variables and tolerance of infant distress.

In summary, this study is the first to examine whether features of parental reflective functioning were associated with tolerance of infant distress by employing both a parenting and non-parenting distress tolerance task. Increased interest

and curiosity in mental states, a key feature of parental reflective functioning, was associated with persisting for longer in soothing an inconsolable baby simulator, but not in a general persistence task. These findings are important in highlighting the role of reflective functioning as a critical faculty of parenting, and further support the ongoing intervention work that seeks to enhance reflective functioning in at-risk parents.

## Acknowledgements

This work was supported by the Anna Freud Centre, NIDA P01 DA022446-05, NIDA R01 DA026437-02, and NICHD R21 HD072574-01. We thank Alethea Mobley, Sam Dailey, Emily Simpson, and Katia Satterfield for assistance with data collection.

## References

- Amador, D., Mayes, L., & Rutherford, H. J. V. (2012). Substance use and depression modulate physiological markers of maternal distress tolerance. In *Paper presented at the Society for Psychophysiological Research Annual Meeting New Orleans*.
- Beck, A. T., & Steer, R. A. (1990). *Manual for the Beck Anxiety Inventory*. San Antonio, TX: Psychological Corporation.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II : 1*. (1) San Antonio, TX: Psychological Corporation.
- Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. R. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology*, *111*, (1), 180–185. <http://dx.doi.org/10.1037/0021-843x.111.1.180>
- Daughters, S. B., Lejuez, C. W., Kahler, C. W., Strong, D. R., & Brown, R. A. (2005). Psychological distress tolerance and duration of most recent abstinence attempt among residential treatment-seeking substance abusers. *Psychology of Addictive Behaviors*, *19*, (2), 208.
- Daughters, S. B., Reynolds, E. K., MacPherson, L., Kahler, C. W., Danielson, C. K., Zvolensky, M., & Lejuez, C. W. (2009). Distress tolerance and early adolescent externalizing and internalizing symptoms: The moderating role of gender and ethnicity. *Behaviour Research and Therapy*, *47*, (3), 198–205.
- Deater-Deckard, K., Sewell, M. D., Petrill, S. A., & Thompson, L. A. (2010). Maternal working memory and reactive negativity in parenting. *Psychological Science*, *21*, (1), 75–79. <http://dx.doi.org/10.1177/0956797609354073>
- Fonagy, P. (1991). Thinking about thinking: Some clinical and theoretical considerations in the treatment of a borderline patient. *International Journal of Psychoanalysis*, *72*, (4), 639–656.
- Fonagy, P., Gergely, G., Jurist, E. L., & Target, M. (2006). *Affect regulation, mentalization, and the development of the self*. London: H. Karnac (Books) Ltd.
- Fonagy, P., Gergely, G., & Target, M. (2007). The parent–infant dyad and the construction of the subjective self. *Journal of Child Psychology and Psychiatry*, *48*, (3–4), 288–328.
- Fonagy, P., Steele, M., Steele, H., Moran, G. S., & Higget, A. (1991). The capacity for understanding mental states: The reflective self in parent and child and its significance for security of attachment. *Infant Mental Health Journal*, *12*, (3), 201–218, doi: 10.1002/1097-0355(199123)12:3<201::aid-imhj2280120307>3.0.co;2-7.
- Fonagy, P., Steele, M., Steele, H., & Target, M. (1998). *Reflective-functioning manual: Version 5.0 for application to the adult attachment interview*. University College London.
- Gonzalez, A., Atkinson, L., & Fleming, A. S. (2009). Attachment and the comparative psychobiology of mothering. In M. De Haan, & M. R. Gunnar (Eds.), *Handbook of developmental social neuroscience* (pp. 225–245). New York: The Guilford Press.
- Gustafson, G. E., & Harris, K. L. (1990). Women's responses to young infants' cries. *Developmental Psychology*, *26*, (1), 144–152.
- Kelly, K., Slade, A., & Grienenberger, J. F. (2005). Maternal reflective functioning, mother–infant affective communication, and infant attachment: Exploring the link between mental states and observed caregiving behavior in the intergenerational transmission of attachment. *Attachment & Human Development*, *7*, (3), 299–311. <http://dx.doi.org/10.1080/14616730500245963>
- Lejuez, C. W., Kahler, C. W., & Brown, R. A. (2003). A modified computer version of the Paced Auditory Serial Addition Task (PASAT) as a laboratory-based stressor. *The Behavior Therapist*, *26*, (4), 290–293.
- Leyro, T. M., Zvolensky, M. J., & Bernstein, A. (2010). Distress tolerance and psychopathological symptoms and disorders: A review of the empirical literature among adults. *Psychological Bulletin*, *136*, (4), 576–600.
- Linden, W., Earle, T., Gerin, W., & Christenfeld, N. (1997). Physiological stress reactivity and recovery: Conceptual siblings separated at birth? *Journal of Psychosomatic Research*, *42*, (2), 117–135.
- Luyten, P., Fonagy, P., Lowyck, B., & Vermote, R. (2012). The assessment of mentalization. In A. Bateman, W. Fonagy, & P. Fonagy (Eds.), *Handbook of mentalizing in mental health practice* (pp. 43–65). Washington, DC: American Psychiatric Association.
- Luyten P., Mayes, L. C., Nijssens, L., & Fonagy, P. The parental reflective functioning questionnaire: Development and preliminary validation, submitted for publication.
- Rutherford, H. J. V., & Mayes, L. C. (2011). Primary maternal preoccupation: Using neuroimaging techniques to explore the parental brain. *Psyche*, *65*, 973–988.
- Sharp, C., & Fonagy, P. (2008). The parent's capacity to treat the child as a psychological agent: Constructs, measures and implications for developmental psychopathology. *Social Development*, *17*, (3), 737–754.
- Slade, A. (2005). Parental reflective functioning: An introduction. *Attachment & Human Development*, *7*, (3), 269–281. <http://dx.doi.org/10.1080/14616730500245906>
- Slade, A., Sadler, L., De Dios-kenn, C., Webb, D., Currier-Ezepchick, J., & Mayes, L. C. (2005). Minding the baby: A reflective parenting program. *The Psychoanalytic Study of the Child*, *60*, 74–100.
- Slade, A. (2007). Reflective Parenting Programs: Theory and Development. *Psychoanalytic Inquiry*, *26*, (4), 640–657. <http://dx.doi.org/10.1080/07351690701310698>
- Suchman, N. E., Decoste, C., Castiglioni, N., Legow, N., & Mayes, L. C. (2008). The mothers and toddlers program: Preliminary findings from an attachment-based parenting intervention for substance-abusing mothers. *Psychoanalytic Psychology: The Official Journal of the Division of Psychoanalysis, American Psychological Association, Division 39*, *25*, (3), 499–517.
- Suchman, N. E., Decoste, C., Castiglioni, N., McMahon, T. J., Rounsaville, B., & Mayes, L. C. (2010). The Mothers and Toddlers Program, an attachment-based parenting intervention for substance using women: Post-treatment results from a randomized clinical pilot. *Attachment & Human Development*, *12*, (5), 483–504. <http://dx.doi.org/10.1080/14616734.2010.501988>
- Suchman, N. E., Decoste, C., Leigh, D., & Borelli, J. (2010). Reflective functioning in mothers with drug use disorders: Implications for dyadic interactions with infants and toddlers. *Attachment & Human Development*, *12*, (6), 567–585. <http://dx.doi.org/10.1080/14616734.2010.501988>
- Swain, J. E. (2011). The human parental brain: In vivo neuroimaging. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *35*, (5), 1242–1254. <http://dx.doi.org/10.1016/j.pnpbp.2010.10.017>
- Zvolensky, M. J., Vujanovic, A. A., Bernstein, A., & Leyro, T. M. (2010). Distress tolerance: Theory, measurement, and relations to psychopathology. *Current Directions in Psychological Science*, *19*, (6), 406–410. <http://dx.doi.org/10.1177/0963721410388642>