Maternal emotion regulation during child distress, child anxiety accommodation, and links between maternal and child anxiety

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A B S T R A C T

Environmental contributions are thought to play a primary role in the familial aggregation of anxiety, but parenting influences remain poorly understood. We examined dynamic relations between maternal anxiety, maternal emotion regulation (ER) during child distress, maternal accommodation of child distress, and child anxiety. Mothers (N = 45) of youth ages 3–8 years (M = 4.8) participated in an experimental task during which they listened to a standardized audio recording of a child in anxious distress pleading for parental intervention. Measures of maternal and child anxiety, mothers' affective states, mothers' ER strategies during the child distress, and maternal accommodation of child anxiety were collected. Mothers' resting respiratory sinus arrhythmia (RSA) reactivity during the recording was also acquired. Higher maternal negative affect and greater maternal ER switching (i.e., using multiple ER strategies in a short time without positive regulatory results) during child distress were associated with child anxiety. Sequential mediation modeling showed that maternal anxiety predicted ineffective maternal ER during child distress exposure, which in turn predicted greater maternal accommodation, which in turn predicted higher child anxiety. Findings support the mediating roles of maternal ER and accommodation in linking maternal and child anxiety, and suggest that ineffective maternal ER and subsequent attempts to accommodate child distress may act as mechanisms underlying the familial aggregation of anxiety.

1. Introduction

Anxiety disorders (ADs) – which affect 8–15% of youth and are associated with reduced quality of life (Comer et al., 2011; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Dougherty et al., 2013; Kessler et al., 2012; Towe-Goodman, Franz, Copeland, Angold, & Egger, 2014) – aggregate in families (e.g., Helenius, Munk-Jorgensen, & Steinhausen, 2014; Last, Hersen, Kazdin, Francis, & Grubb, 1987; Turner, Beidel, & Costello, 1987). The mechanisms underlying familial aggregation remain poorly understood, although research supports an interaction of genetic and environmental factors (Hettema, Neale, & Kendler, 2001; Murray, Creswell, & Cooper, 2009). Given low-to-moderate genetic heritability estimates (Hettema et al., 2001), and anxiety etiological models have increasingly emphasized the role of anxiety-enhancing parenting behaviors in the development and/or maintenance of child ADs (Chorpita & Barlow, 1998; Cooper-Vince, Pincus, & Comer, 2014; Ginsburg, Siqueland, Masia-Warner, & Hedtke, 2004).

1.1. Parenting behaviors and child anxiety

McLeod, Wood, and Weisz (2007) meta-analysis found several parental "control" behaviors have reliably been linked with childhood anxiety, with low levels of parental autonomy-granting and high parental over-involvement accounting for the greatest variance. Conceptual models emphasize how these behaviors can result in the child feeling incapable of independently navigating age-appropriate tasks (e.g. Chorpita & Barlow, 1998; Rapee, 2001). These models suggest that parent-child relationships characterized by high levels of parental control can contribute to the development and/or maintenance of child anxiety over time through parental support of an anxious cognitive style and parental reinforcement of child behavioral avoidance.

Experimental evidence suggests dynamic and transactional relationships between overprotective/controlling parenting and child anxiety (Hudson & Rapee, 2001; Turner, Beidel, Roberson-Nay, & Tervo, 2003; Van Der Bruggen, Stams, & Bogels, 2008; Woodruff-Borden et al., 2002). Overprotective sequences in anxious families are often prompted by negative child affect (Hudson, Comer, & Kendall, 2008;

Hudson & Rapee, 2001, 2002), and such parenting behaviors typically do not present in the absence of child distress (Hudson et al., 2008). Although parental involvement can reduce child distress in the short-term, it can maintain anxiety in the long-term as the child is denied opportunities to master distress independently.

One relevant form of parental involvement is *parental accommodation* (PAcc), referring to parental modifications such as providing reassurance to an anxious child, enabling or encouraging a child to avoid anxiety-provoking situations, or adjusting family routines to reduce or prevent child distress. PAcc was initially studied in families affected by OCD (Storch et al., 2007), but recent data suggest it is seen transdiagnostically across anxious families (Lebowitz, Omer, Hermes, & Scahill, 2014; Lebowitz, Scharfstein, & Jones, 2014; Lebowitz et al., 2013; Thompson-Hollands, Kerns, Pincus, & Comer, 2014). Studies linking PAcc and child anxiety have either evaluated accommodation *frequency* (i.e., how often or severe is the accommodation) or *timing* (latency between child distress and accommodation). Regarding *frequency*, Lebowitz et al. (2013) found that 61% of mothers of anxious children participated daily in child symptoms (Lebowitz, Omer, et al., 2014; Lebowitz, Scharfstein et al., 2014). PAcc frequency is associated with functional interference and maternal stress (Thompson-Hollands et al., 2014).

Regarding accommodation *timing*, Aschenbrand and Kendall (2012) had mothers listen to an audiotaped vignette of a child becoming distressed and pleading for parental intervention. Half were informed the child was anxious and half were informed the child was not anxious. While listening to the vignette, parents were instructed to indicate if at any point they would acquiesce to the child's avoidant request. Whereas mothers of non-anxious youth intervened later if told the vignette child was anxious, mothers of anxious youth did not. Further, mothers of anxious youth reported increases in their own anxiety and negative affect, and decreases in positive affect, following the recording, whereas mothers of non-anxious youth did not.

Scant empirical attention has been given to parents' internal phenomena when children display distress and how such processes may mediate links between parental anxiety and PAcc of child distress. In particular, parental emotion regulation (ER) – defined as the ways in which individuals influence which emotions they have, when they have them, and how they experience and express them (Gross, 1998) – may impact anxious behavioral responding. Anxious individuals generally rely on more maladaptive ER strategies and less adaptive strategies (Aldao, Nolen-Hoeksema, & Schweizer, 2010; McLaughlin, Mennin, & Farach, 2007).

Parents of anxious children experience increased distress relative to parents of non-anxious children while observing negative child emotions (Aschenbrand & Kendall, 2012; Turner et al., 2003), but research has not examined *what parents do* to regulate their increased negative affect in these instances, the effectiveness of such strategies, and whether effective parental ER versus dysregulation during child distress differentially predicts PAcc patterns. An improved understanding of parental ER during child distress, and its links with subsequent PAcc behaviors, is key for understanding familial aggregation of anxiety. Furthermore, emerging research supports the role of parental ER in the development of child ER (Bariola, Gullone, & Hughes, 2011; Morelen, Shaffer, & Suveg, 2014), and may have important implications for child anxiety interventions. Remmes and Ehrenreich-May (2014) found adaptive parental ER was associated with less parental distress and more supportive responses to child negative affect.

The importance of ER *variability* – referring to the flexible range of different strategies used by an individual to regulate emotions across

situations – has been increasingly recognized. Rather than classifying ER strategies as either categorically "adaptive" or "maladaptive," emerging work highlights the importance of access to a range of strategies for flexibly confronting the different demands of varied situations (Aldao, Sheppes, & Gross, 2014; Bonanno & Burton, 2013; Kashdan & Rottenberg, 2010). However, ER variability by itself is not sufficient for adaptive regulation. In a given situation, what determines whether an approach is adaptive is whether it is successful in helping situational goal attainment (Aldao et al., 2014; Gross, 2015). In fact, in a given situation, excessive variability of utilized ER strategies (i.e., ER *switching*) may be maladaptive if it blocks goal attainment. Switching rapidly between different strategies without successful regulation may constitute erratic or unskilled ER and may not allow the individual to commit enough time or resources to a single strategy and observe results. Research has not yet examined parental ER switching in the context of child distress or PAcc.

Parasympathetic nervous system (PNS) functioning provides an ER index and can complement self-reports (Mendes, 2009). When confronted with a challenge, Polyvagal Theory (Porges, 2007) asserts that the PNS rapidly withdraws, allowing for flexible/adaptive responding by the sympathetic nervous system (SNS). The most commonly used PNS indicator is respiratory sinus arrhythmia (RSA), or variations in the interbeat interval of an individuals' heart rate that occur within the frequency band of respiration (Allen, Chambers, & Towers, 2007). RSA can index ER capabilities, with higher resting RSA – often referred to as vagal tone – indicating better coping capacity in the face of emotional distress (Butler, Wilhelm, & Gross, 2006; Fabes & Eisenberg, 1997). Furthermore, greater vagal suppression (i.e., withdrawal of parasympathetic functions) when transitioning from rest to distressing/challenging states can index autonomic flexibility, active engagement with environmental demands, and adaptive ER (Appelhans & Luecken, 2006; Beauchaine, 2001; Porges, 2007). Research has found associations between anxiety and lower vagal tone (i.e., resting RSA), and associations between anxiety and reduced vagal reactivity (i.e., RSA suppression) during emotionally challenging tasks (Friedman, 2007). However, no studies have considered parental parasympathetic influences when confronting child distress.

1.2. Proposed model and the present study

The present study examined a model (*see* Fig. 1) in which maternal anxiety is indirectly related to child anxiety through associated maternal ER difficulties during child distress and PAcc behaviors. In this model, maternal anxiety is seen as a risk factor leading to parental ER difficulties during child distress. Parental ER difficulties may be indexed by ER switching, or by PNS inflexibility (low RSA suppression), and when these "internal" processes fail to produce desired regulatory effects, mothers resort to controlling the environment through use of a situational modification strategy (i.e., PAcc) to reduce immediate child distress. That is, for anxious mothers, PAcc may function to extrinsically regulate child emotions while simultaneously intrinsically regulating their own emotions. PAcc, in turn, is mutually reinforcing for both mother and child by reducing short-term distress.

The present experimental investigation examined mothers' ability to regulate their emotions during child distress, as well as the extent to which maternal ER and consequent PAcc mediate links between maternal and child anxiety. Specifically, we exposed mothers to child expressions of anxious distress (i.e., audiotape of a standardized child crying and pleading for mother to come back to child's bedroom after child has been put down to sleep) to capture maternal responses in real

Fig. 1. Hypothesized model of the intergenerational transmission of anxiety through maternal emotion regulation abilities and accommodation behaviors.

time. We assessed mothers' ER switching during the child distress task, as well as mothers' PNS activity to provide complementary psychophysiological ER data. Maternal accommodation frequency and timing were also assessed. We hypothesized that maternal and child anxiety would be associated with one another, and that each would be associated with maternal accommodation frequency and timing. It was also expected that maternal and child anxiety would be significantly related to maternal ER switching in the presence of child distress, as well as reduced parasympathetic flexibility during the task. Further, it was predicted that mothers of more anxious children would report more subjective distress and larger increases in negative affect during the child distress task. Based on the proposed conceptual model (*see* Fig. 1), sequential mediation models were tested to examine the extent to which maternal ER processes (i.e., ER switching, parasympathetic inflexibility) and maternal accommodation frequency and timing explained the links between maternal and child anxiety.

2. Methods

2.1. Participants

Participants were 45 English-speaking mothers of children ages 3–8 years (M = 4.84, SD = 1.7) with varied levels of maternal and child anxiety (Mean mother age = 38.00, SD = 5.7). Mothers of children with parent-reported developmental delay or externalizing problems, or who received prior CBT, were excluded. To ensure anxiety variability, mothers were recruited from diverse settings via community recruitment flyers, online advertisements, and from child mental health clinics. Regarding race/ethnicity, 80.5% were white/Caucasian, 14.6% bi/multiracial, 2.4% Asian/Asian-American, and 2.4% American Indian/Native American. Total annual household income varied: 4.4% reported ≤\$25,000, 11.1% reported \$25–49,999, 13.3% reported \$50,000–74,999, 15.6% reported \$75–99,999, 37.8% reported \$100–200,000, and 17.8% reported ≥\$200,000.

2.2. Measures

2.2.1. Child anxiety

The Total Score of the *Spence Children's Anxiety Scale for Parents* (SCAS-P; Spence, 1999) – a 39-item parent-report of child anxiety in youth ages 6–18 – was used to assess child anxiety in families with 6–8 year-olds. The SCAS-P has demonstrated good internal consistency, convergent validity, and discriminant validity (Nauta et al., 2004; present α = 0.94). The Total Score of the *Preschool Anxiety Scale-Revised* (PAS-R; Spence et al., 2008) – a 34-item parent-report of anxiety among preschoolers – was used to assess child anxiety in families with 3–5 year-olds. The PAS-R is a downward extension of the SCAS-P for younger children and has demonstrated good construct validity and reliability (Spence, Rapee, McDonald, & Ingram, 2001; present α = 0.95).

To conduct analyses across the entire sample, a standardized anxiety variable was computed based on individual PAS-R scores (for 3–5 year olds) and SCAS-P scores (for 6–8 year olds), relative to published norms. Specifically, standardized anxiety scores reflect each child's deviation from the published means of the PAS-R (Nauta et al., 2004) or SCAS-P (Spence et al., 2001), taking into account child age and gender. For example, given that the PAS-R mean for 4-year-old boys in published community norms (Nauta et al., 2004) is 14.12 (SD = 8.79), a 4-year-old boy in this sample who scored 34 would receive a standardized anxiety score of 2.26.

2.2.2. Maternal anxiety

The Anxiety Scale of the *Depression Anxiety Stress Scales-21* (DASS-21; Lovibond & Lovibond, 1995) – a self-report questionnaire assessing negative emotional states in adults – assessed mothers' anxiety. The DASS Anxiety Scale has demonstrated excellent internal consistency

and validity (Antony, Bieling, Cox, Enns, & Swinson, 1998; present α = 0.82).

2.2.3. Maternal accommodation of child anxiety

2.2.3.1. *Accommodation frequency.* Mothers completed the *Family Accommodation Scale-Anxiety* (FASA; Lebowitz et al., 2013), which asks parents to rate the frequency of their participation in their child's anxiety-related behaviors (e.g., assisting avoidance, providing reassurance) and modification of family routines because of child anxiety. The FASA has demonstrated strong reliability and validity (Lebowitz et al., 2013; present α = 0.96).

2.2.3.2. *Accommodation timing.* The *Child Distress Task* (CDT) is a computerized task developed for the present study to examine the timing of PAcc after a distressed child pleads to avoid an anxious situation. The CDT was modeled on work by Aschenbrand and Kendall (2012) examining parental latency to intervene in older anxious children. During the CDT, mothers are instructed:

> You will hear audio of a 5-year-old boy/girl who is fearful of sleeping alone. Imagine you are his/her mother and you've already completed his/her normal bedtime routine. You have just left his/her room, and you hear him/her calling you to come back to his/her room. While listening, press "T" if, at any point, you would go back into his/her room.

Mothers then listen to a standardized recording of a young distressed child pleading for his/her mother. The stated gender of the child is matched to each mother's own child's gender. Maternal accommodation *timing* is measured as the time (in milliseconds) the mother listens before pressing "T." Mothers could press "T" as soon as the audio began, but regardless of accommodation timing, all mothers listened to the recording for a minimum of three minutes to capture sufficient cardiac data for psychophysiological analyses. Participants could listen for up to seven minutes.

2.2.4. Maternal affect during the CDT

Subjective Units of Distress (SUDS) measured mother's distress on a 0–10 scale at baseline and post-CDT. This method for assessing distress is common in clinical settings and in studies entailing mood inductions and behavioral tasks (e.g., Feldner et al., 2006).

The *Positive and Negative Affect Schedule* (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item measure of transient affective states that was used to assess mothers' positive affect (PA) and negative affect (NA) at baseline and post-CDT. The PANAS is used to measure state affect and affect changes in response to mood inductions and shows strong psychometric properties (Crawford & Henry, 2004; Watson et al., 1988). Internal consistency in the current sample was adequate at baseline (α_{Pos} = 0.87; α_{Neg} α = 0.61) and post-CDT (α_{PA} = 0.79; α_{NA} = 0.89).

2.2.5. Maternal emotion regulation during the CDT

2.2.5.1. *ER switching.* As research on the construct of ER switching is new, there is not yet an established measure of the construct. For the present study, immediately following the CDT we had participants self-report whether they engaged in each of six ER strategies during the CDT: relaxation, suppression, acceptance/allowance, distraction, avoidance, and/or reappraisal. After participants responded to these six items, an "ER switching" score was calculated by summing the ER strategies self-reported by participants, with higher scores indicating greater ER switching during the task. As noted, higher ER switching in the absence of goal attainment (i.e., negative mood reduction) may indicate maladaptive ER and a "failure to settle" on an effective/coherent ER strategy (Gross, 2015).

2.2.5.2. *Respiratory sinus arrhythmia.* During baseline and the CDT, an electrocardiogram modified Lead II configuration collected cardiac data and a respiration belt over the diaphragm collected respiration data. A

BioNex 2-slot chassis acquired data (sampling frequency = 1000 Hz). RSA values were calculated during baseline ($RSA_{Resting}$) as a measure of general ER abilities. Scores during the CDT (RSA_{CDT}) were used as a measure of ER during the task. Controlling for $RSA_{Resting}$ in RSA_{CDT} analyses yields a measure of RSA reactivity ($RSA_{Reactivity}$). RSA calculations were based upon 60-s data epochs, sampled from each task component (i.e., baseline, CDT). Mindware HRV analysis software (Mindware Technologies, Gahanna, OH) identified R-peaks using spectral analysis in the high-frequency band of 0.12–0.40 Hz, while controlling for respiration (Allen et al., 2007). Visual inspection of data and artifact cleaning followed. One $RSA_{Resting}$ value was identified as an outlier (i.e., > 11) and replaced with the next highest value in the dataset.

2.3. Procedures

Procedures were approved by the Boston University IRB. After confirming initial study eligibility, interested mothers were consented and sent a link to a survey of baseline study measures (i.e., child anxiety, maternal anxiety, and maternal accommodation frequency), and then scheduled for a laboratory visit. At this visit, mothers were connected to the psychophysiology equipment by the researcher and asked to sit still for a five-minute baseline while resting cardiac data were collected and the researcher observed from behind a one-way mirror. Mothers then completed the CDT (see Measures). Maternal distress and affective state measures were completed at baseline and post-CDT. Mothers were compensated $50.

2.4. Data analysis

Means and SDs were computed for all variables, and correlational analyses examined pairwise associations. In analyses incorporating psychophysiological data, $RSA_{Reactivity}$ during the CDT was examined by predicting RSA_{CDT} while controlling for $RSA_{Resting}$. Frequencies of individual ER strategies used during the CDT were computed.

To assess indirect pathways between maternal and child anxiety, sequential mediation analyses (X- > M_1- > M_2- > Y) investigated maternal ER (M_1) and maternal accommodation of child distress (M_2) as intermediary links between maternal anxiety (X) and child anxiety (Y) (see Fig. 2). Within each model, one direct pathway (X- > Y) and three indirect pathways (X- > M_1- > Y; X- > M_2- > Y; and X- > M_1- > M_2- > Y) were investigated. Two maternal ER variables (ER switching, $RSA_{Reactivity}$) were examined as M_1 mediators, and two maternal accommodation variables (frequency and timing) were tested as M_2 mediators. For each model, the indirect effect passing solely through the M_1 mediator was computed as a_1b_1, the indirect effect passing solely through the M_2 mediator was computed as a_2b_2, and the serial indirect

effect of X on Y passing through both mediators was computed as $a_1d_{21}b_2$ (Hayes, 2013; Taylor, MacKinnon, & Tein, 2008). In accordance with Hayes, Preacher, and Myers (2011) mediation analyses were conducted regardless of whether bivariate correlations between X and Y variables were significant.

Mediation analyses were conducted using the PROCESS macro for SPSS (Hayes, 2013). Bias-corrected bootstrapping methods were applied to determine 95% confidence intervals for all effects (Hayes et al., 2011). When the confidence interval does not overlap with 0, the null hypothesis of no mediation is rejected (Taylor et al., 2008).

3. Results

3.1. Preliminary findings

A Shapiro–Wilk test of normality indicated accommodation timing scores were non-normal ($p < 0.001$) and therefore logarithmic transformations of these scores were used in analyses. All other study variables were normally distributed.

Table 1 presents means and SDs for study variables. On average, child anxiety scores were 0.60 SDs above normative means, with the lowest score falling 1.61 SDs below age/gender-matched norms, and the highest score falling 5.12 SDs above age/gender-matched norms. Overall, maternal anxiety scores were in the normal range, although scores spanned the entire range from "normal" to "extremely severe." On average, mothers waited 118,803 milliseconds during the CDT before indicating they would intervene (range: 2471–420,000 ms). RSA values were also within the normal range.

3.2. CDT manipulation check

A paired samples *t*-test showed an increase in reported maternal distress from baseline ($SUDS_{Baseline}$) to CDT ($SUDS_{CDT}$), $t(44) = -13.64, p < 0.0001$.

3.3. Changes in NA and PA

Mothers reported an increase in NA from baseline ($M = 11.74$, $SD = 2.27$) to CDT ($M = 24.12$, $SD = 8.74$) [$t(42) = 9.47$, $p < 0.0001$] and a decrease in PA from baseline ($M = 31.05$, $SD = 6.98$) to CDT ($M = 24.37$, $SD = 6.72$) [$t(42) = -7.10$, $p < 0.0001$].

3.4. Pairwise associations

Table 1 presents bivariate correlations between variables. In addition, associations between variables and $RSA_{Reactivity}$ during the CDT
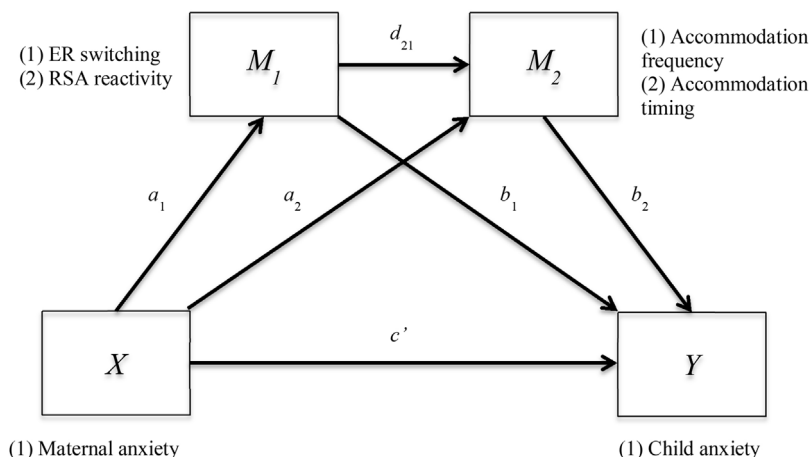

Fig. 2. Diagram of sequential mediation model of proposed mediators of the relationship between maternal risk factors and child anxiety.

Table 1
Associations among study variables.

Study Variable	M (SD)	1	2	3	4	5	6	7
1. Maternal Anxiety	2.86 (5.06)	–						
2. $RSA_{Resting}$	5.79 (0.98)	−0.09	–					
3. Child Anxiety[a]	0.58 (1.68)	0.35[*]	−0.10	–				
4. ER Switching	2.98 (1.83)	0.25	−0.22	0.54[***]	–			
5. RSA_{CDT}	5.52 (0.92)	−0.01	0.65[***]	−0.08	−0.20	–		
6. $RSA_{Reactivity}$[b]	–	0.16	–	−0.08	−0.20	–	–	
7. Accommodation Frequency	9.21 (8.68)	0.50[**]	−0.22	0.74[***]	0.47[**]	−0.04	0.03	–
8. Accommodation Timing[c]	118803.30 (147258.69)	0.17	0.11	−0.05	0.04	−0.15	−0.14	−0.13

Note: CDT = Child Distress Task; EA = Experiential Avoidance; ER = Emotion Regulation; RSA = Respiratory Sinus Arrhythmia.
[a] Standardized score (see Methods).
[b] Coefficients in this row and column refer to partial correlations between study variables and maternal RSA_{CDT} after controlling for $RSA_{Resting}$.
[c] In milliseconds; Variable has been log transformed for correlational analyses.
[*] $p < 0.05$.
[**] $p < 0.01$.
[***] $p < 0.001$.

are included and represent partial correlations between study variables and RSA_{CDT} after controlling for $RSA_{Resting}$. Child anxiety was associated with maternal anxiety, maternal ER switching, and maternal accommodation frequency. Maternal anxiety was also correlated with accommodation frequency. $RSA_{Resting}$ was correlated with RSA_{CDT}. Contrary to hypotheses, maternal accommodation *timing*, unlike maternal accommodation *frequency*, did not demonstrate a significant relationship with any study variables. Child anxiety was not associated with maternal $RSA_{Resting}$ or $RSA_{Reactivity}$.

3.5. Maternal use of ER strategies, and engagement in ER switching, during the CDT

Participants reported using a range of ER strategies during the CDT, including acceptance (69.8%), avoidance (48.8%), suppression (48.8%), reappraisal (46.5%), distraction (44.2%), and relaxation (39.5%). Seven percent of mothers reported using no strategies, 23.3% used 1 strategy, 11.6% used 2, 16.3% used 3, 14.0% used 4, 20.9% used 5, and 7.0% used all 6. Maternal anxiety was not associated with any individual ER strategies. Maternal ER switching was significantly associated with increased NA during the task, measured by predicting NA during the task after controlling for baseline NA [$R^2 = 0.318$, $p < 0.0001$], as well as with greater child anxiety [$R^2 = 0.291$, $p < 0.0001$]. Greater child anxiety was also associated with larger increases in maternal NA during the CDT [$R^2 = 0.115$, $p = 0.032$].

3.6. Mediators of the association between maternal and child anxiety

When examining maternal ER switching and maternal accommodation *frequency* as potential mediators of the link between maternal and child anxiety, the direct effect between maternal and child anxiety was no longer significant, $t(41) = -0.41$, $p = 0.69$ (see Table 2). The indirect effect of maternal anxiety on child anxiety, via maternal ER switching was positive and significant, as was the indirect effect via

maternal accommodation frequency. Further, the sequential mediation effect was positive and significant, indicating that maternal anxiety was linked with child anxiety through its effect on maternal ER switching during child distress, which in turn was associated with more frequent maternal accommodation that is linked with child anxiety (total indirect effect = 0.12; 95% bias-corrected bootstrap CI: 0.04, 0.31).

When examining ER switching and maternal accommodation *timing* as mediators of the relationship between maternal and child anxiety, the direct effect between maternal and child anxiety was also no longer significant, $t(41) = 1.47$, $p = 0.15$ (see Table 2). The indirect effect of maternal anxiety on child anxiety via maternal ER switching was again significant and positive, however the indirect association through maternal accommodation timing was not significant nor was the sequential mediation model examining both ER switching and accommodation timing as sequential mediators. This indicates that maternal anxiety is linked with child anxiety through its effect on ER switching during child distress, but that accommodation *timing* does not play a mediating role (total indirect effect = 0.04; 95% bias-corrected bootstrap CI: −0.01, 0.14).

When investigating maternal $RSA_{Reactivity}$ and accommodation *frequency* as mediators of the link between maternal and child anxiety, none of the three indirect pathways were significant (see Table 2) (total indirect effect = 0.11; 95% bias-corrected bootstrap CI: −0.03, 0.39). Similarly, when investigating maternal $RSA_{Reactivity}$ and accommodation *timing* as mediators of the link between maternal and child anxiety, none of the three indirect pathways were significant (see Table 2) (total indirect effect = −0.01; 95% bias-corrected bootstrap CI: −0.09, 0.05).

None of these findings were moderated by recruitment source (mental health clinic versus community recruitment). Specifically, the index of moderated mediation was non-significant when examining maternal ER switching and maternal accommodation frequency as potential mediators of the mother-child anxiety link (index of moderated mediation = 0.02; 95% CI: −0.93, 0.36), when examining ER switching and maternal accommodation timing as mediators (index of

Table 2
Details of mediation models predicting links between maternal anxiety and child anxiety.

Maternal emotion regulation (M_1) variable	Parental accommodation (M_2) variable	c'	Mediation path 1 (a_1b_1)	Mediation path 2 (a_2b_2)	Sequential mediation ($a_1d_{21}b_2$)
ER switching	Frequency	−0.02	0.027[a]	0.073[a]	0.022[a]
ER switching	Timing	0.07	0.047[a]	−0.007	0.000
$RSA_{Reactivity}$	Frequency	−0.01	−0.001	0.115	−0.001
$RSA_{Reactivity}$	Timing	0.11	−0.001	−0.005	0.000

Note: ER = Emotion Regulation; M_1 = Mediator 1; M_2 = Mediator 2; RSA = Respiratory Sinus Arrhythmia.
[a] Null hypothesis rejected; 95% bias-corrected bootstrap confidence interval around effect does not overlap with 0, based on 10,000 bootstrap samples.

moderated mediation = −1.59; 95% CI: −6.39, 3.62), when examining maternal RSA$_{Reactivity}$ and accommodation frequency as mediators (index of moderated mediation = 0.05; 95% CI: −0.51, 0.41), or when examining maternal RSA$_{Reactivity}$ and accommodation timing as mediators (index of moderated mediation = 0.02; 95% CI: −0.93, 0.36).

4. Discussion

The present findings provide new insight into the familial aggregation of anxiety by clarifying the mediating roles of both maternal ER during child distress and frequency of maternal accommodation of child distress in the association between maternal and child anxiety. Specifically, these findings extend previous models of parenting behaviors associated with child anxiety (Chorpita & Barlow, 1998; Lebowitz et al., 2013; McLeod et al., 2007; Thompson-Hollands et al., 2014) by examining how maternal ER difficulties during child distress mediate links between maternal anxiety and "anxiety-enhancing" parental behaviors such as PAcc, as well as how PAcc promotes child anxiety. In doing so, it is the first study to examine PAcc behaviors as a downstream effect of poor parental ER when children are in distress, and to consider these associations in the context of relations between parent and child anxiety.

Sub-components in this sequential pathway have been observed previously. For instance, parental anxiety has been linked with child anxiety (Last et al., 1987; Turner et al., 1987), parental accommodation has been associated with child anxiety (Lebowitz et al., 2013; Thompson-Hollands et al., 2014), and there has been a small literature beginning to consider whether mothers of anxious youth have ER difficulties (Cheron, Ehrenreich, & Pincus, 2009; Remmes & Ehrenreich-May, 2014). However, no prior study has examined each step of this pathway in one sample, such that sequential mediation and indirect pathways between parental and child anxiety could be pursued. Additionally, this investigation employed a multimodal experimental approach that directly exposed parents to child distress and measured emotional responding in situ. Given previous work highlighting how parental responses to child affect are context-dependent (e.g., Hudson et al., 2008; Hudson & Rapee, 2001, 2002), the present methodology overcame limitations inherent in research relying exclusively on parent self-reports about general ER processes and parenting. Moreover, this study was able to more comprehensively test how robust findings were across component subdomains. For example, three different significant sequential mediation pathways included accommodation *frequency* as a penultimate link between maternal and child anxiety, whereas no indirect pathways included accommodation *timing* as a significant link.

In addition to supporting a sequential indirect pathway from maternal anxiety to child anxiety via maternal ER switching during child distress and accommodation frequency, these findings are also the first to establish direct relationships between parental ER difficulties and PAcc. This suggests that for anxious mothers, accommodation behaviors may represent extrinsic ER strategies after their intrinsic ER strategies in the face of child distress have failed. Future research is needed to examine other pathways through which parental ER difficulties may lead to child anxiety, outside of their effects on PAcc. Parental modeling of poor ER abilities may be one such mechanism.

No models supported vagal suppression as a mediator between maternal risk factors and child anxiety. This suggests that mothers' *explicit* strategies to regulate their emotions during child distress (e.g., maternal distraction) and mothers' *explicit* switching of ER strategies during child distress may provoke anxiety-related parenting practices more than *implicit* ER governed by the autonomic nervous system. These findings raise the question of how influential parental cognitive appraisals may be on parenting behaviors in such scenarios. For example, a parent who experiences a perceived lack of control over their child's anxiety – regardless of their actual physiological response – may be more likely to subjectively demonstrate ineffective ER practices. Future research should examine parents' interpretations of their child's distress as well as their interpretation of their own behavior, which may help elucidate the strength of association between explicit ER strategies and PAcc behaviors. Additionally, future studies should examine whether maternal parasympathetic reactivity is associated with other processes linking maternal and child anxiety.

Consistent with recent calls to expand ER research to incorporate a more contextual perspective (Aldao, 2013), this study investigated ER processes in the specific interpersonal context of parent-child interactions during child distress. Furthermore, the present study captured mothers' spontaneous ER strategy use, including ER switching. While the majority of experimental ER research has examined the effectiveness of particular strategies that participants are instructed to use, our findings indicate that the process by which an individual naturalistically selects and utilizes ER strategies is also important. Furthermore, findings suggest that anxious mothers' unskilled use of ER strategies may be a worthy target of interventions.

Findings may have important implications for interventions targeting child ADs. Given that up to 40% of anxious youth remain symptomatic following CBT and that relapse after successful treatment remains high (Ginsburg et al., 2014; Silverman, Pina, & Viswesvaran, 2008), it is imperative to clarify etiologic and maintaining factors of child anxiety that can better inform treatment efforts. It has been suggested that parental involvement in treatment may improve CBT response, but studies comparing family-based CBT versus individual child CBT show mixed results (Barmish & Kendall, 2005; Breinholst, Esbjørn, Reinholdt-Dunne, & Stallard, 2012; Wei & Kendall, 2014). Although treatments for young anxious children invariably include heavy parental involvement (e.g., Comer et al., 2012), type of parental involvement is inconsistent across protocols. The overwhelming diversity of parent components among treatment protocols indicates a lack of consensus regarding how best to involve parents in child treatment. Our findings suggest that parent ER abilities and consequent PAcc frequency are key factors whose assessment can inform treatment planning. Furthermore, given the role of parents in CBT as exposure coaches outside of treatment sessions, parents who struggle to regulate their own emotions during child distress may be less successful at facilitating out-of-session exposures. Teaching parents strategies to regulate their *own* emotions in these situations so they do not accommodate may prove useful for some.

Some newer treatments for young children with ADs focus explicitly on reducing PAcc behaviors (Comer et al., 2012; Lebowitz, Omer, et al., 2014; Lebowitz, Scharfstein et al., 2014). In these treatments, parents are taught to resist impulses to assist their child in avoidance or modify routines to accommodate child avoidance. In the present study, *how often* mothers accommodated but not *how soon* they accommodated mediated relationships between maternal risk factors and child anxiety, suggesting that family CBT for child anxiety should focus directly on reducing PAcc across a variety of situations, rather than emphasizing the timing of these parental behaviors in a graduated manner. Interestingly, recent research by Craske, Treanor, Conway, Zbozinek, and Vervliet (2014) examining inhibitory learning in exposure therapy suggests that exposures can be enhanced through maximal violation of expectancies and variability of feared stimuli, and that such an approach may be more effective than habituation-based exposure (e.g., exposing a patient to the same stimulus for long durations until fear ratings decline). The present findings may support the use of an inhibitory learning model of exposure to target PAcc frequency across different situations, rather than a habituation-based model in which exposures are implemented while gradually reducing maternal accommodation for increasingly longer periods.

4.1. Limitations and future directions

Several limitations merit comment. First, maternal and child anxiety were measured continuously using self- and parent-report questionnaires, respectively, and diagnostic statuses are unknown. The

Exploratory analyses examining whether recruitment source (mental health clinic versus other) moderated outcomes were non-significant, suggesting dimensional conceptualizations of anxiety may be best suited for assessing mechanisms underlying anxiety aggregation in families. Second, as ER switching is a relatively new construct of study, no established measures of ER switching yet exist. Accordingly, the methods used to assess ER switching in the present study were novel and may have failed to correctly capture the construct. Continued work in the development of valid and reliable methods with which to assess ER switching is needed to further inform research in this area. Third, although several predicted pathways were found significant, future work with larger samples may be useful to provide even greater power with which to empirically consider the complex sequential mediation relationships proposed in the present conceptual model. Fourth, given research indicating sex differences in resting RSA (Jönsson & Sonnby-Borgström, 2003), we limited the present study to just mothers. Given that fathers of anxious children also exhibit PAcc (Thompson-Hollands et al., 2014), future work is needed to examine paternal ER and accommodation behaviors, and their links to child anxiety. Fifth, although the CDT methodology ensured standardization of the child distress stimulus from an internal validity perspective, such standardization may have limited the ecological validity of the task. It is possible that accommodation *timing* and $RSA_{Reactivity}$ may in fact mediate links between maternal and child anxiety when examined in the context of their own specific child's distress. Sixth, CDT instructions were intentionally vague so parents could most easily project themselves into the situation, but this precluded contextual information that could influence parental responding (e.g. the presence of sleeping siblings). Future research taking a more idiographic approach could complement the present findings by exposing parents to their own child's distress.

Finally, although this investigation incorporated an experimental component, many associations were cross-sectional, precluding causal influences. Given the dynamic and transactional nature of parent-child processes related to anxiety, future research should examine dyadic interactions over time incorporating longitudinal methods. Furthermore, most measures used in this study were mother-reported. While it is typical to rely on parent reports of psychopathology in young children, single-informant methods can introduce reporting biases (Comer & Kendall, 2004). Teacher reports and observations of child anxiety and avoidance in laboratory tasks may be useful in future research.

Despite these limitations, the present study provides initial support for a serial mediator model examining familial aggregation of anxiety, and positions parental emotion dysregulation and accommodation behaviors at its core. Treatments targeting child anxiety rarely address parental ER and may do well to incorporate components for some families that specifically target parental ER during displays of child anxiety. Future longitudinal work and research with clinical populations is needed to further evaluate the pathways presently observed to more comprehensively clarify parental processes implicated in the intergenerational aggregation of anxiety.

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