



The Anger-Distress Model of Temper Tantrums: Associations with Emotional Reactivity and Emotional Competence

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RUNNING HEAD: Temper tantrums

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Abstract

The goals of this investigation were (a) to assess the structural validity of the anger-distress model of temper tantrums, and (b) to examine the associations among temper tantrums, emotional reactivity and emotional competence in a community sample of preschoolers. A parent-report measure, the Temper Tantrum Grid, was used to measure the frequency of common tantrum behaviours. Laboratory and parent report measures of emotional reactivity and emotional competence were administered. Confirmatory factor analysis supported the proposal that anger and distress are separate but overlapping tantrum processes. Correlation analyses showed that temper tantrum anger and distress were related to emotional reactivity and emotional competence. There was no evidence to support the notion that emotional competence moderated the effect of emotional reactivity on temper tantrums. In contrast, emotional competence was a significant mediator of the association between emotional reactivity and temper tantrums. Overall, the results support the anger-distress model of temper tantrums. The findings suggest that children's temper tantrums are systematically related to the overall organization of emotion and behaviour in preschool children.

Nearly every parent of a preschool child has experienced the sudden and explosive (and if displayed in public, quite embarrassing) outbursts of emotion that occur throughout toddlerhood and early childhood. These outbursts are known as temper tantrums, which have been defined as brief but intense emotional episodes characterized by explosive, impulsive, and out-of-control displays of emotion (M. Potegal, personal communication, May 30, 2007). The term *temper* refers to the dynamic qualities of the child's affect (its intensity and explosiveness), whereas *tantrum* denotes its externalizing form (disorganized and highly active). Temper tantrums are common among preschoolers with prevalence estimates ranging from 50 - 91% (Goodenough, 1931; Jenkins, Bax, & Hart, 1980; Richman, Stevenson, & Graham, 1975). Such wide estimates of prevalence reflect, in part, declines in tantrum prevalence over the toddler and preschool years (Potegal & Davidson, 2003; Potegal & Archer, 2004). Understanding temper tantrums is important because they are an early form of externalizing behaviour, and individual differences in tantrums may contribute to the development of later conduct problems (Belden, Thomson, & Luby, 2008; Campbell, Shaw, & Gilliom, 2000; Degnan, Calkins, Keane, & Hill-Soderlund, 2008; Huesmann, Dubow, & Boxer, 2009; Keenan & Wakschlag, 2000). Despite an extensive literature detailing the sequelae of early behaviour and emotional problems, little empirical research has been devoted to temper tantrums.

Potegal and colleagues (Potegal & Davidson, 2003; Potegal, Kosorok, & Davidson, 2003) have proposed a model of tantrum behaviours in which *anger* and *distress* are partially overlapping but independent emotional and behavioural tantrum constituents. According to this model, anger rises quickly, has its peak near the beginning of the tantrum and then declines while components of distress increase in probability later in the tantrum. We refer to this model as the anger-distress model of temper tantrums because anger and distress are proposed as processes

underlying the organization of tantrum behaviours. The model was recently extended to account for 'rages' among older (age 4-12) psychiatric inpatients (Potegal, Carlson, Margulies, Gutkovitch, & Wall, 2009). To date, the model has not been independently corroborated. Furthermore, the usefulness of the model for understanding the development and organization of emotional behaviour in young children has not been examined. We examine the anger-distress model of temper tantrums in relation to emotional reactivity and emotional competence because these are well-known aspects of children's emotional functioning that should be systematically related to the qualities of their temper tantrums. To our knowledge, no previous research has examined the relations among temper tantrums, emotional reactivity and emotional competence.

Emotional Reactivity and Emotional Competence

Within days or weeks of birth, infants begin to display relatively stable and enduring (and presumably biologically based) behavioural and emotional tendencies (Zentner & Bates, 2008). Emotional behaviours, especially the characteristic inclination to react to stimulation (or the lack of stimulation) with emotional distress, are a central component of temperament (Goldsmith et al., 1987). Emotional reactivity refers to a child's arousability (in neuroendocrine, autonomic, and affective systems) in the face of an emotionally relevant challenge (Zentner & Bates, 2008).

Emotional reactivity helps humans achieve their goals and adapt to their environments (Campos, Frankel, & Camras, 2004), but the development of emotional competence adds a counterbalance to reactivity that is critical for adaptive and context-sensitive behaviour (Trentacosta & Izard, 2007). Emotional competence is a multifaceted construct that highlights the complex interplay and integration of the component skills required to modulate emotional reactivity. Denham (1998) has proposed three elements of emotional competence that allow young children to mobilize their personal and environmental resources. The first component is

emotion knowledge or understanding. Emotion knowledge includes the ability to discern one's own and others' emotional states and to use emotion vocabulary. Emotion knowledge (and language more generally) is a tool for conceptualizing and responding to emotional experiences (Giesbrecht, Müller, & Miller, 2010). Talking about emotional experience, for example, encourages reflection that offers children a "multipurpose vehicle" for regulating emotions (Kopp, 1989). Deficits in emotion knowledge among preschoolers are predictive of problem behaviour (e.g., angry, explosive behaviour) in grade three, even after controlling for verbal ability and emotional reactivity (Izard, Fine, Schultz, Mostow, Ackerman, & Youngstrom, 2001).

A second component of emotional competence is the functional or communicative use of emotion – that is, knowledge about how and when to express emotion in order to communicate internal experience. The preschool years are an important period in which children learn to use their emotions as social signals (Denham, 1998). Positive affect, for example, may promote affiliation, whereas negative affect, especially anger, can interfere with the development of peer relationships (Denham et al., 2003). Frequent and intense expressions of negative emotions, such as temper tantrums, also increase the likelihood that a child will become the target of peer bullying (Giesbrecht, Leadbeater, & MacDonald, in press).

Finally, emotion regulation is a third aspect of emotional competence (Denham, 1998). Emotion regulation is "a multifaceted phenomenon whose development arises from the growth and integration of many behavioral and biological processes" (Thompson, Lewis, & Calkins, 2008, p. 124) that function to monitor and modify emotional experience and behaviour in keeping with self-regulatory goals (Thompson, 1994). Emotion regulation helps to safeguard individuals from uncomfortably high levels of excitement and distress. During the preschool period, emotion regulation becomes increasingly important as the complexity of emotional and

social experiences expands (Denham et al., 2003). Achieving a comfortable range of emotional homeostasis is essential for establishing and maintaining goal directed behaviours and positive peer relationships. Children who are unable to maintain appropriate emotional arousal are at risk for developing internalizing or externalizing problems (Calkins & Howse, 2004).

Children who are more emotionally reactive tend to be less emotionally competent (Vaughan Sallquist et al., 2009), and these emotional difficulties have direct relevance to children's social adjustment. However, two studies by Eisenberg and colleagues (Eisenberg et al., 1993; 1995) have shown that although emotional reactivity and emotional competence are related to sociometric status, the effect is much stronger for children who are simultaneously high in reactivity and low in competence. Such evidence suggests that both emotional reactivity and emotional competence are important to our understanding of children's social adjustment.

In contrast, the relevance of emotional reactivity and emotional competence to children's behavioural adjustment remains less clear. There is some evidence, for example, that emotional reactivity and lack of emotional competence are linked to externalizing behaviour (Degnan et al., 2008), and that negative emotionality and emotional competence interact in predicting externalizing behaviours (Eisenberg et al., 1996). However, whereas the strength of the association between social outcomes and emotional reactivity depends on the level of emotional competence, this might not be the case for externalizing behaviours. The association between reactivity and externalizing behaviour may hold regardless of the level of emotional competence because emotionally competent children would be expected to be low in externalizing behaviour even when they become emotionally aroused (Eisenberg et al., 2000).

The Present Study

The goals of the present study were to assess the structural validity of the anger-distress model of temper tantrums proposed by Potegal and Davidson (2003) and to investigate its associations with emotional reactivity and emotional competence in a community sample of preschoolers. Given the potential for the anger-distress model of temper tantrums to generate important questions about the development of emotional organization in young children, corroboration of the model is an important first step toward a conceptual and measurement framework for conducting temper tantrum research. Specifically, as part of our efforts to probe the links between the anger-distress model of temper tantrums and the anger and distress components of emotional reactivity and emotional competence, we examined correlations among these constructs to determine whether their relations are specific (i.e., anger-anger and distress-distress) or more general, we tested moderation models to determine *under what conditions* emotional reactivity was associated with temper tantrums, and we tested mediation models to explain *by what means* emotional reactivity could influence temper tantrums.

Method

Participants

This study was part of a larger investigation of self-regulation and school readiness. Families with children aged 3 to 5 years were sought via letters sent through daycares and preschools, and advertisement (parenting magazine, parenting website) in an urban Canadian area. In total, 133 parents agreed to participate - two children did not agree to be tested, two refused to complete many of the tasks, two were excluded because of concerns about developmental delays, and two others were excluded because they were multivariate outliers (Mahalanobis $D^2 < 0.001$). Half of the excluded children were female. There were no significant differences on any of the demographic variables between children remaining and those excluded

from the study. The final sample of 125 children was aged 36.0 - 68.2 months ($M = 50.5$ months, $SD = 6.85$ months). Sixty one percent ($n = 77$) were male. The majority of children ($n = 113$) came from 2 parent families, with 2 or more children ($n = 97$). Approximately half had an older sibling ($n = 55$), and just under half had a younger sibling ($n = 51$). The median education level for both the parent completing the questionnaires and the child's other parent was a 4-year university degree. Return rate for the parent questionnaire was 100%. Parents received financial compensation (\$25) for their participation.

Procedure

Testing sessions were videotaped for offline scoring. The tasks in our extensive battery were divided into two sessions to reduce participant fatigue. Whenever possible, the two sessions were held on separate days; when this was not possible, a 20 – 60 minute break was interposed between the sessions. There were no reliable differences (all $ps > .05$) in children's performance when tested on the same day as compared to when tested on two days. The order in which children completed the two sessions was randomly assigned; however, task order within each session was the same for all children.

Measures

Our selection of measures was based on several considerations. First, we employed multiple informants in order to provide converging evidence for the associations of interest. To facilitate this, measures of emotional reactivity and emotional competence were obtained from both laboratory procedures (referred to as child measures) and parent report. Second, we utilized multiple measures of each construct in order to assess the multifaceted nature of emotional processes. Third, and taking our cue from Thompson (1994), we included diverse measures of emotional processes in order to capture broad indicators of emotional competence. Finally, in

order to maximize the distinction between the different emotion-related constructs, we selected conceptually and methodologically distinct measures.

Emotional Reactivity

Child Measure

Separate measures of anger and sadness/distress reactivity were derived from the child version of the Children’s Coping scale (described below). The proportion of situations in which children reported feeling angry was used as a measure of anger reactivity, whereas the proportion of situations in which children reported feeling sad was used as a measure of sadness/distress reactivity.

Parent Report

Children’s Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006). The CBQ is a multifactorial and widely used measure of child temperament. Given our interest in the anger and distress aspects of temper tantrums, we administered the anger/frustration and sadness scales of the CBQ, both of which load onto the emotional reactivity factor of the CBQ. Internal consistency was adequate for both the anger scale ($\alpha = .80$) and the sadness scale ($\alpha = .70$), which are comparable to the reliability values published by the authors.

Emotional Competence

Child Measure

Emotion understanding. Emotion understanding was evaluated in two ways using procedures developed by Denham (1986), which involve affective labeling. First, children were shown a card depicting facial line drawings of five emotions (sad, angry, happy, fearful, and neutral or OK) and were asked to identify the face depicting each emotion. Items were scored as correct or incorrect. Secondly, children were asked an emotion understanding question (“How

would you feel if the situation happened to you?") for each of the three vignettes (described below). Any negative emotion was accepted as a correct answer, whereas positive emotions were scored as incorrect. Correct responses from the two tasks were summed.

Emotion regulation. An adapted version of the Children's Coping Scale (Eisenberg et al., 1993) was used as an observational measure of children's emotion regulation. The task consisted of three vignettes based on the thematic content of the Children's Coping Scales: (a) a social exclusion situation, in which a peer group refused to play with the child; (b) a peer rejection situation, in which the child was made fun of by peers; and (c) a peer aggression situation in which the child's sand castle was destroyed by a peer. Each vignette was accompanied by an illustration of the vignette content. Care was taken in constructing the illustrations to ensure that the characters were gender neutral and emotion neutral. The vignettes were administered in a random order.

The emotion regulation questions for each vignette consisted of two constructive and two maladaptive strategies. For the social exclusion vignette, for example, one maladaptive strategy was, "Would you feel better if you yelled at the other children?" and a constructive strategy was, "Would you feel better if you asked the teacher for help?" These were forced choice questions for which children answered "yes" or "no." One point was awarded for each maladaptive strategy endorsed¹. Internal consistency of the items was adequate ($\alpha = .77$).

Parent Report

Children's Coping Scale. The Children's Coping Scale (Eisenberg et al., 1993) assesses child coping in three emotionally relevant situations. Parents are asked to rate the extent to which their child was likely to use each of 9 different coping strategies on a 5-point Likert-type scale

¹ Internal consistency for the positive coping items was not acceptable and these items were therefore eliminated from further consideration.

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3 ranging from *extremely untrue* to *extremely true*. Of particular interest were (a) coping strategies
4 that employed instrumental or emotional aggression and (b) strategies in which venting of
5 emotion was the primary focus. These two classes of strategy were emphasized because they
6 may be differentially related to anger (externalizing) and distress (internalizing). Internal
7 consistency of the Instrumental and Emotional Aggression and Venting scales in the current
8 sample were high ($\alpha = .91$, and $.88$, respectively).
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18 *The Emotion Questionnaire*. The Emotion Questionnaire (Rydell, Berlin, & Bohlin,
19 2003) is a parent-report measure of emotional reactivity and emotion regulation. Parents are
20 asked to provide both global ratings of regulatory competence and ratings of regulation in
21 specific situations using a 5-point Likert-type scale ranging from *doesn't apply at all* to *applies*
22 *very well*. Items pertaining to the regulation of the Anger and Sadness scales had adequate
23 internal consistencies ($\alpha = .87$ and $.77$, respectively) that are in keeping with psychometric
24 values published by the authors (Rydell et al., 2003; Rydell, Thorell, & Bohlin, 2007).
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Temper Tantrums

The Temper Tantrum Grid (adapted from Potegal & Davidson, 2003) assesses frequency and intensity of 10 behaviours commonly displayed during temper tantrums: crying, whining, screaming, yelling words, kicking, hitting, stamping, running away, throwing things, and pushing or pulling objects. Temper tantrums were defined as episodes of strong facial expression of emotion combined with one or more of these behaviours. First, parents rated the overall frequency of tantrums in the previous month (using the geometric interval scales of Potegal – which are grounded in familiar time periods of days, weeks, and months). Next, parents estimated the percent of tantrums in which the individual behaviours occurred. The product of

these two values (frequency of tantrums X percent of tantrums in which individual behaviours occurred) was used to estimate the overall frequency of each individual behaviour.

Verbal Ability

Children's receptive vocabulary was assessed with the Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997). Raw scores (ceiling item minus number of errors) were used in data analyses.

Statistical Procedure

Confirmatory factor analysis (CFA) was used in order to estimate a latent measurement model and obtain corresponding latent factor scores for the 10 temper tantrum behaviour variables. The use of CFA has many statistical advantages, including the isolation and estimation of unique sources of variance in the observed variables (increased construct validity), and the ability to analyze only the variance that is common across multiple observed variables for each latent factor (increased convergent validity; Bryant & Yarnold, 1994). We used the software package Amos 17.0 (Arbuckle, 2008) to fit CFA models on the covariance matrix of the temper tantrum behaviour variables, with maximum likelihood estimation. Estimated means and intercepts were selected to account for missing data.

Mediation analyses were conducted using models with multiple proposed mediators to simultaneously assess multiple aspects of emotional competence as potential mediators for the effect of emotional reactivity on temper tantrums. Multiple mediation models have several advantages over specifying and testing separate simple mediation models, including the ability to assess the overall effects of a set of variables (e.g., different aspects of emotional competence) on the relation between emotional reactivity and temper tantrums, and reducing parameter bias due to omitted variables (Preacher & Hayes, 2008). Bootstrap procedures described by Preacher and

Hayes (2008) were used to estimate the indirect effect of emotional reactivity on temper tantrums because they are particularly suited for mediation analyses with small samples (Preacher & Hayes, 2004; Shrout & Bolger, 2004) and are currently recommended as best practice in developmental psychology (Dearing & Hamilton, 2006). The reported results are based upon bias corrected and accelerated (BCa) confidence intervals to account for the fact that, unlike regular confidence intervals, the distribution of point estimates resulting from the bootstrapping procedure is often asymmetric (Efron, 1987). BCa confidence intervals were set at .95 with 5000 resamples.

All analyses included child age and PPVT as developmental covariates to account for rapid changes in emotional abilities that occur between the ages of 3 and 5 years. Separate analyses were conducted for child observation and parent report.

Results

Descriptive Statistics

Means, standard deviations and range of all study variables are presented in Table 1. Mean verbal ability was in the normal range with a standard score equivalent of 104. All of the temper tantrum behaviours occurred with sufficient frequency and individual variability to make their analyses meaningful. The proportions of tantrums in which the individual tantrum behaviours occurred were generally higher than the behavioural prevalence reported by Potegal and Davidson (2003).

Confirmatory Factor Analysis of Temper Tantrum Behaviours

Our first goal was to test the anger-distress model of temper tantrums proposed by Potegal and Davidson (2003). In order to determine a best fit to the observed data, we estimated and compared a hypothesized two-factor model (with anger and distress as latent variables) to a

one-factor model. Anger and distress were allowed to correlate in the two-factor model because Potegal and Davidson have suggested that these processes are separate but related aspects of temper tantrums. Model fit was evaluated using the chi-square goodness-of-fit test (Loehlin, 1998), chi-square/degrees-of-freedom (Bollen, 1989), the comparative fit index (CFI; Bentler, 1990), and the root mean square error of approximation (RMSEA; Steiger, 1990). Model comparison was evaluated using the chi-square difference test (Bollen, 1989) and Akaike's information criterion (AIC; Bozdogan, 2000). According to conventions associated with all of the fit indices (with the exception of RMSEA), the overall fit between the two-factor model and the observed data was good, $\chi^2(33, N = 125) = 71.02, p < .01, \chi^2/df = 2.15, CFI = .96, RMSEA = .096$, whereas the overall fit between the one-factor model and the observed data was unsatisfactory, $\chi^2(35, N = 125) = 143.72, p < .01, \chi^2/df = 4.11, CFI = .88, RMSEA = .157$. Moreover, the model comparison values indicated that the two-factor model ($AIC = 135.02$) fitted the observed data significantly better than the one-factor model, $\Delta\chi^2(1, N = 125) = 72.70, p < .001, AIC = 203.72$. As a result, the one-factor model was rejected in favour of the two-factor model. Figure 1 depicts the factor correlation, standardized parameter estimates, and individual squared multiple correlation values for the two-factor model. The correlation between temper tantrum anger and distress was significant ($r = .79$, critical ratio = 5.79, $p < .01$). All observed temper tantrum behaviour variables loaded significantly on their corresponding latent factors with critical ratios ranging in value from 3.68 to 13.19 (all $ps < .01$). The observed variable 'yell words' was allowed to cross-load onto both latent factors because it was hypothesized to have both anger and distress characteristics. All variance values were positive, and there was no indication of problems with residual values (e.g., large or negative values).

Having supported the structural validity of the anger-distress model, we retained the factor-score weights from the two-factor model in order to probe their associations with emotional reactivity and emotional competence. Specifically, factor scores were estimated by: (a) calculating z scores across participants for all 10 temper tantrum behaviour variables, (b) multiplying the z scores by their corresponding factor-score weights from the CFA, and (c) summing the products to generate individual factor-score estimates (for justification, see MacDonald, Stigsdotter-Neely, Derwinger, & Bäckman, 2006).

Associations among Measures of Anger and Distress

Correlations among the anger/frustration and the sadness/distress components of temper tantrums, emotional reactivity and emotional competence are displayed in Table 2.

Child Measure

Marginally significant associations were found between temper tantrum distress and child measures of both maladaptive coping ($r = -.18, p = .07$) and emotion understanding ($r = -.17, p = .08$). Children with better emotion understanding had less temper tantrum distress, but, surprisingly, less temper tantrum distress was also associated with increased maladaptive coping. Temper tantrum anger was not related to child measures of emotional reactivity or competence.

Parent Report

Temper tantrum anger and distress were moderately correlated with parent report measures of emotional reactivity and emotional competence. The parent report results indicated that temper tantrum anger was related to the anger aspects of emotional reactivity and competence, and temper tantrum distress was related to the sadness/distress aspects of emotional reactivity and competence. However, the anger and distress components of temper tantrums did not differentially predict anger/frustration and sadness/distress aspects of emotional reactivity

and emotional competence. That is, temper tantrum anger was related to both anger/frustration and sadness/distress reactivity and competence, and temper tantrum distress was related to both anger/frustration and sadness/distress reactivity and competence. Furthermore, the anger and distress components of temper tantrums were generally equally related to the other parent report measures. For example, temper tantrum anger and distress were equally related to anger/frustration reactivity, partial $r_s = .55$ and $.59$, respectively, $p_s \leq .001$. The notable exception was aggressive coping, which was more strongly related to temper tantrum anger than distress ($r = .51$, $p \leq .001$, and $r = .31$, $p \leq .01$, respectively).

The analyses to this point have focused on understanding the pattern of associations among temper tantrum anger and distress and the anger/frustration and sadness/distress aspects of emotional reactivity and competence. The final two sets of analyses probed these associations further through moderator and mediator analyses to address *when* and *how* temper tantrums are related to emotional reactivity. Using moderator analyses, we assessed whether the association between emotional reactivity and temper tantrums depended on the child's level of emotional competence. Mediator analyses were used to assess whether emotional reactivity had an indirect effect on temper tantrums that was mediated by emotional competence.

Emotional Competence as a Moderator

Child Measure

Based on the pattern of correlations reported in Table 2, moderator analysis for child measures was conducted only for temper tantrum distress. Separate regression analyses were conducted for emotion understanding and maladaptive coping to determine whether either of these emotional competencies moderated the relation between sadness/distress reactivity and temper tantrum distress. Age and verbal ability were included as covariates. Neither of the

models was significant, $F(5, 115) = .96, p > .10$, and $F(5, 113) = .48, p > .10$, for emotion understanding and maladaptive coping, respectively.

Parent Report

Separate regression analyses were conducted for anger and distress variables to determine if the magnitude of the association between parent-reported emotional reactivity and temper tantrums varied as a function of parent-reported emotional competence. Age and verbal ability were included as covariates. The overall models for both anger and distress were significant, $F(5, 116) = 10.39, p \leq .001$, and $F(5, 116) = 2.32, p \leq .05$, respectively. In both models, the interaction terms between emotional competence and emotional reactivity did not make a significant contribution ($\beta = -.02, p > .10$ for anger, and $\beta = -.37, p > .10$ for distress).

Emotional Competence as a Mediator

Finally, mediation analysis was used to investigate whether emotional reactivity has an indirect effect on temper tantrums via emotional competence. Separate analyses were conducted for the anger and distress measures.

Child Measure

Given that emotional understanding was the only child measure with (marginally) significant simple and partial correlations with temper tantrum distress, a simple mediation model was constructed with the child measure of sadness/distress reactivity as the predictor, emotion understanding as the mediator, temper tantrum distress as the outcome, and child age and PPVT as control variables (see Figure 2). The indirect effect for emotion understanding was significant, with a point estimate of $-.1064, SE = .0578, z = 1.84, p < .05$, and a 95% BCa bootstrap CI of $-.1567$ to $-.0025$, indicating that emotion understanding mediated the relation between sadness/distress reactivity and temper tantrum distress, even after controlling for child

age and PPVT. The direction of the estimates in each pathway (Figure 2) indicated that greater sadness/distress reactivity led to decreased emotion understanding, which in turn led to increased temper tantrum distress.

Parent Report

Temper tantrum anger. As can be seen in Figure 3, the multiple mediator model for anger consisted of parent-reported anger/frustration reactivity as the predictor, anger regulation and aggressive coping as mediators, temper tantrum anger as the outcome, and child age and PPVT as covariates. The total indirect effect for the set of emotional competence variables was significant, with a 95% BCa bootstrap *CI* of .0846 to .3658, indicating that anger regulation and aggressive coping mediated the relation between anger/frustration reactivity and temper tantrum anger. The direction of the estimates in each pathway (Figure 3) indicated that greater anger/frustration reactivity led to decreased regulation of anger and increased aggressive coping, which in turn led to increased temper tantrum anger. As reported in Table 3, examination of the specific indirect effects for each mediator revealed that only anger regulation was a unique mediator, 95% BCa *CI* of .0981 to .3009, after controlling for aggressive coping, child age, and PPVT. Aggressive coping did not significantly contribute to the total indirect effect above and beyond the anger regulation.

Temper tantrum distress. The multiple mediator model for distress (see Figure 4) consisted of parent-reported sadness/distress reactivity as the predictor, regulation of sadness/distress and venting as proposed mediators, temper tantrum distress as the outcome, and child age and PPVT as covariates. The total indirect effect for the set of emotional competence variables was significant, with a 95% BCa bootstrap *CI* of .0146 to .2035, indicating that regulation of sadness/distress and venting mediated the relation between sadness/distress

reactivity and temper tantrum distress. As can be seen in Figure 4, the direction of the estimates in each pathway indicated that greater sadness/distress reactivity led to decreased regulation of sadness/distress and increased venting, which in turn led to increased temper tantrum distress. As reported in Table 3, examination of the specific indirect effect of each mediator revealed that only venting was a unique mediator, 95% BCa *CI* of .0011 to .1360, after controlling for regulation of sadness/distress, child age, and PPVT. Regulation of sadness/distress did not significantly contribute to the total indirect effect above and beyond venting.

Discussion

The goals of the present study were to assess the structural validity of the anger-distress model of temper tantrums proposed by Potegal and Davidson (2003) and to investigate its associations with emotional reactivity and emotional competence. In order to achieve our goals, we used CFA to test a two-factor model of temper tantrums, and then retained factor scores to probe the associations between temper tantrums, emotional reactivity, and emotional competence. We tested moderation models to determine *under what conditions* emotional reactivity was associated with temper tantrums, and we tested mediation models to explore *by what means* emotional reactivity could influence temper tantrums.

Specifically, as part of our efforts to probe the links between the anger-distress model of temper tantrums and the anger and distress components of emotional reactivity and emotional competence, we examined correlations among these constructs to determine whether their relations are specific (i.e., anger-anger and distress-distress) or more general, we tested moderation models to determine *under what conditions* emotional reactivity was associated with temper tantrums, and we tested mediation models to explain *by what means* emotional reactivity could influence temper tantrums.

CFA supported the structural validity of the anger-distress model of temper tantrums (Potegal & Davidson, 2003). The two-factor solution with anger and distress as separate yet correlated factors emerged as the best fitting solution. This CFA constitutes a strong test of the anger-distress model for two reasons. First, CFA is a theory-driven technique that allowed us to specify the loadings for each factor in accordance with a priori hypotheses. Second, whereas Potegal and Davidson (2003) used behavioural duration in their principal components analysis, frequency of behaviours was used here. It should be noted, however, that the anger-distress model, as reported by Potegal, does not differentiate between screaming and yelling words. Our choice to include both in the model was based upon the notion that screaming, among young children, is often associated with pain and distress and, in functional terms, solicits succorance whereas yelling words is a symbolic form of aggression associated with temper tantrum anger (Goodenough, 1930).

The pattern of correlations between the study measures provided strong evidence that temper tantrum behaviours are associated with children's emotional reactivity and emotional competence. However, these correlations were not specific to a particular emotional tone (e.g., anger component of temper tantrums to anger aspect of emotional reactivity) but more general (e.g., anger component of temper tantrums showed similarly strong correlations to both the anger and sadness aspects of emotional reactivity). The lack of specificity in the relations between the anger/frustration aspects and the sadness/distress aspects of these constructs suggests that the organization of temper tantrum behaviours may be more dependent on a general level of arousal than arousal that is specific to anger or distress. In contrast, there was some evidence that children whose tantrums were characterized by high levels of anger often engage in maladaptive or aggressive coping strategies, as opposed to venting. These findings are in keeping with the

several recent reports that tantrums characterized by high anger and aggression are associated with a diagnosis of externalizing disorders whereas tantrums characterized by distress are associated with internalizing disorders (Belden et al., 2008; Potegal et al., 2009). It may be that the tendency to act in aggressive or destructive ways does require specific anger arousal, whereas all other tantrums reflect a more general emotional reactivity.

Moderator analyses revealed that the association between emotional reactivity and temper tantrums does not depend on the level of emotional competence. Put another way, the relation between emotional reactivity and temper tantrums is not significantly different at both high and low levels of emotional competence. These findings are broadly consistent with those of Eisenberg et al. (2000), who suggested that the association between emotional reactivity and externalizing behaviour may hold regardless of the level of emotional competence because emotionally competent children would be expected to be low in externalizing behaviour even when they become emotionally aroused. Indeed, the present findings support the argument that the strength of the association between temper tantrums and emotional reactivity does not depend on the child's level of emotional competence. That is, the answer to the question of *when* or *under what circumstances* the association between emotional reactivity and temper tantrums holds is that it holds at all levels of emotional reactivity and emotional competence.

In contrast, results of the mediation analysis suggest that emotional competence plays an important role in the relation between emotional reactivity and temper tantrums. Mediator analyses revealed that, in part, the effect of emotional reactivity is indirect – or mediated – through emotional competence. This finding supports the general hypothesis that poor emotional competence accentuates the influence that emotional reactivity has on behaviour, whereas adequate emotional competence attenuates this influence. In other words, a child's level of

emotional competence will either disrupt or facilitate the progression from emotional arousal toward a temper tantrum. In practical terms, these findings suggest that two children with similar thresholds for emotional reactivity may display widely different frequencies of temper tantrums if their levels of emotional competence differ. No one is surprised when an emotionally reactive child becomes intensely emotional and “freaks out”. Rather, it is surprising that some children become intensely emotionally aroused but nevertheless maintain a sense of behavioural and emotional organization. The value of emotional competence is not that it makes children more docile or placid but that it actively “checkmates” the forcefulness of emotional impulses, allowing them to step back and withhold an immediate response, survey the environment, and reflect on the course of action instead of being dominated by immediate arousal.

Unfortunately, children who are emotionally reactive may have difficulty developing emotional competencies, and this difficulty exacerbates the underlying proclivity to move from emotional arousal to temper tantrums. Emotional reactivity, for example, is a risk factor for a variety of negative developmental outcomes, both short- and long-term (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Rende, 1993; Thomas & Chess, 1968; but see Seifer, Sameroff, Baldwin, & Baldwin, 1992). An important agenda for future research will be to document both the factors that contribute to the development of emotional competencies among emotionally reactive children and the constraints the prevent opportunities for the development of emotional competencies. We believe there are at least two reasons that emotionally reactive children fail to develop strong emotional competencies. The first is that children have difficulty learning from their experiences when they become overwhelmed by emotion. The second is that children who often ‘fly off the handle’ tend to evoke power-assertive and controlling responses from adults

who view the child as incapable of taking responsibility for their own actions. As a consequence, important opportunities for the development of emotional competence are lost.

At the same time, the mediating role of emotional competence suggests an opportunity for intervention. For example, emotion understanding was shown to mediate the relation between sadness/distress reactivity and temper tantrums distress – emotion understanding is an aspect of emotional competence that can be strengthened with practice. That is, teaching reactive preschoolers about their emotions and about strategies for dealing with emotions may improve their emotional competence and assist them in developing a more balanced organization of their reactive and regulatory behaviours.

Some limitations of these results should be taken into consideration. The primary limitation is that temper tantrum assessment was based exclusively on parent report. Potegal and Davidson (2003) reported reasonable consistency ($r = .61, p < .001$) between parental ratings of temper tantrum frequency using two different methods. Nevertheless, it will be important in future research to include more objective measures of temper tantrums (perhaps using ecological momentary assessment; Smyth & Stone, 2003) to ensure the reliability of these data. Another limitation is that the sample did not span the entire age range in which tantrums are normally expected; children as young as 12 months and as old as 6 years should be included in future studies. Finally, this study did not address the possibility that temper tantrums may have some instrumental value to children that affects the frequency and intensity of their tantrums. For example, children who learn that a parent will relent upon threat of a major tantrum may learn to exaggerate their tantrum behaviour as a means to control the parent's behaviour.

Despite its limitations, it is noteworthy that multiple converging measures of each construct were included in this study. Importantly, both child measures and parent report

measures were related to temper tantrums. This study provided support for the anger-distress model of temper tantrums and examined the associations between the anger and distress aspects of emotional reactivity and emotional competence. Longitudinal research is needed to test the developmental hypothesis that increases in emotional competence are linked with decreases in temper tantrums. These findings are important for intervention work because they suggest that emotional competence can buffer the effects of emotional reactivity on externalizing behaviours.

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Table 1. Descriptive Statistics

	<i>M</i>	<i>SD</i>	Minimum	Maximum	Prevalence ^a
Age (months)	50.53	6.85	37.10	68.20	
PPVT (raw)	68.57	17.71	25	102	
Temper Tantrum Behaviours					
Cry	9.11	4.10	1	25	.79
Whine	8.66	4.26	1	25	.73
Seek Comfort	9.03	4.03	1	20	.77
Yell Words	7.62	4.11	1	20	.64
Scream	5.95	4.28	1	20	.49
Throw	4.79	3.11	1	15	.40
Hit	4.99	3.26	1	16	.41
Kick	4.45	2.82	1	12	.37
Stamp	4.97	3.45	1	16	.41
Grab, Push/Pull	5.61	3.82	1	16	.45
Child Measure					
Anger/Frustration Reactivity	.77	.97	0	3	
Sadness/Distress Reactivity	1.70	1.13	0	3	
Emotion Understanding	7.19	1.19	3	8	
Maladaptive Coping	0.54	0.39	0.00	1.00	
Parent Report					
Anger/Frustration Reactivity	3.46	.84	1.70	5.70	
Sadness/Distress Reactivity	3.49	.71	1.82	5.64	

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Aggressive Coping	2.92	1.51	1.00	6.33
Venting	4.68	1.26	1.5	7.0
Regulation of Anger/Frustration	3.59	.86	1	5
Regulation of Sadness/Distress	3.78	.72	1	5

^a Prevalence is the decimal fraction of tantrums in which the behaviour occurred.

Table 2. Correlations (and partial correlations controlling for child age and PPVT) between study measures

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. TT Anger	-	.84*** (.84)***	.09 (.08)	-.01 (.01)	-.06 (-.10)	-.07 (-.09)	.55*** (.55***)	.20* (.20*)	.51*** (.51***)	.23* (.24*)	-.40*** (-.41***)	-.25** (-.25**)
2. TT Distress		-	.05 (.04)	-.02 (-.01)	-.11 (-.18) [†]	-.18 [†] (-.17) [†]	.57*** (.59***)	.22* (.23*)	.31** (.30**)	.22* (.23*)	-.39*** (-.43***)	-.25** (-.25**)
Child Measure												
3. Anger/Frustration Reactivity				-.66*** (-.65***)	.13 (.05)	.14 (.28**)	.10 (.02)	.08 (.09)	.11 (.07)	-.06 (-.06)	-.01 (.03)	-.01 (.03)
4. Sadness/Distress Reactivity					-.14 (-.06)	.47*** (.33***)	-.10 (-.03)	-.06 (-.11)	-.08 (-.02)	.12 (.12)	-.01 (-.03)	-.05 (-.03)
5. Maladaptive Coping						-.16 [†] (-.05)	-.10 (-.17)	-.11 (-.08)	.08 (.07)	.11 (.09)	.21* (.25**)	.13 (.12)
6. Emotion Understanding							-.08 (-.05)	.05 (-.03)	-.03 (.07)	.05 (.13)	.03 (.03)	.02 (.08)
Parent Report												
7. Anger/Frustration Reactivity								.43*** (.40***)	.38*** (.33***)	.25** (.27**)	-.58*** (-.57***)	-.44*** (-.42***)
8. Sadness/Distress Reactivity									.12 (.09)	.38*** (.39***)	-.33*** (-.33***)	-.35*** (-.33***)
9. Aggressive Coping										.36*** (.36***)	-.26** (-.25**)	-.28** (-.29**)
10. Venting											-.22* (-.23*)	-.32*** (-.37***)
11. Regulation of Anger/Frustration												.59*** (.59***)
12. Regulation of Sadness/Distress												-

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3. Indirect effects of parent-reported emotional reactivity on temper tantrums

Model Summary for Anger/Frustration					
	Point Estimate	SE	z	Bootstrap BCa 95% CI	
				Lower	Upper
Total	.2101	.0706	3.503***	.0846	.3658
Regulation of Anger/Frustration	.1834	.0516	3.528***	.0981	.3009
Aggressive Coping	.0267	.0475	1.680	-.0784	.1131

Model Summary for Sadness/Distress					
	Point Estimate	SE	z	Bootstrap BCa 95% CI	
				Lower	Upper
Total	.0976	.0490	2.575**	.0146	.2035
Regulation of Sadness/Distress	.0418	.0294	1.727	-.0010	.1146
Venting	.0535	.0354	1.923*	.0011	.1360

* $p < .05$; ** $p < .01$; *** $p < .001$. BCa, bias corrected and accelerated. Estimates based on 5000

bootstrap samples

Figure Caption

Figure 1. CFA model for temper tantrum behaviours

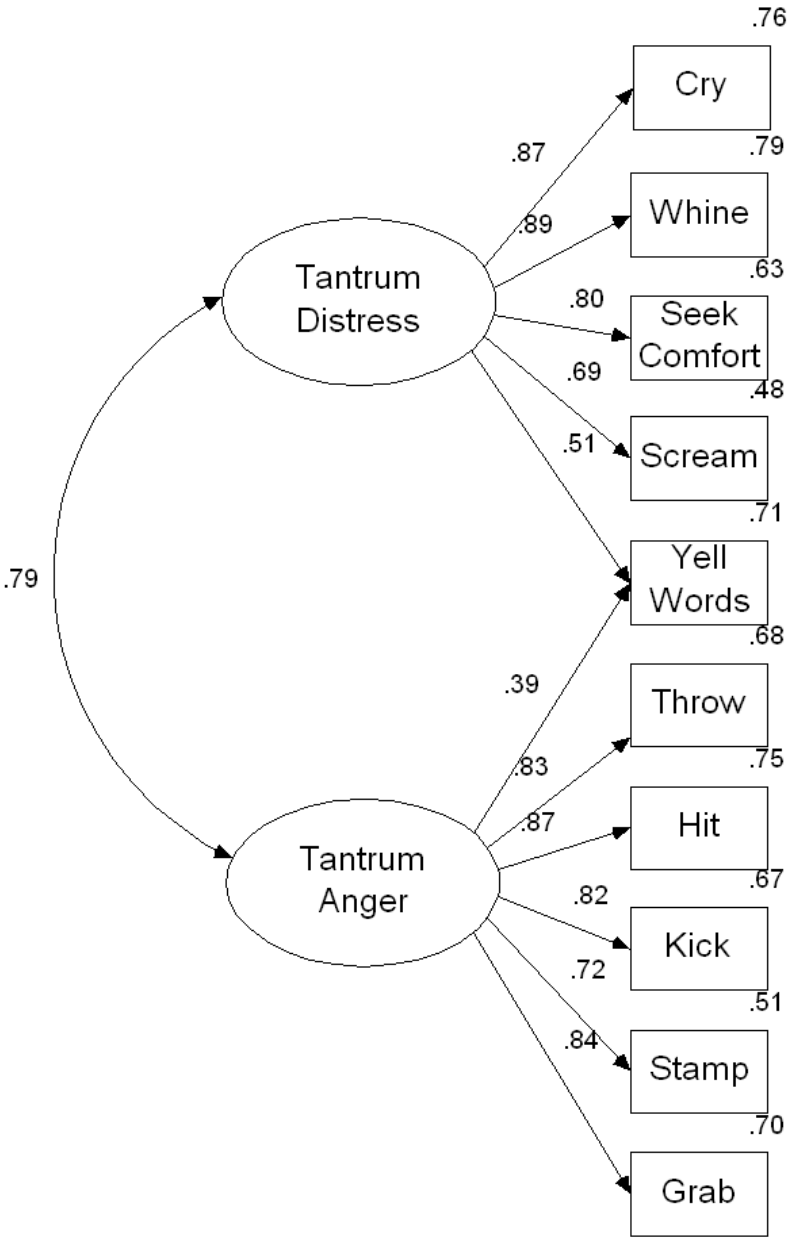
Figure 2. Simple mediation model for the child measure of sadness/distress

Figure 3. Multiple mediation model of parent reported anger/frustration

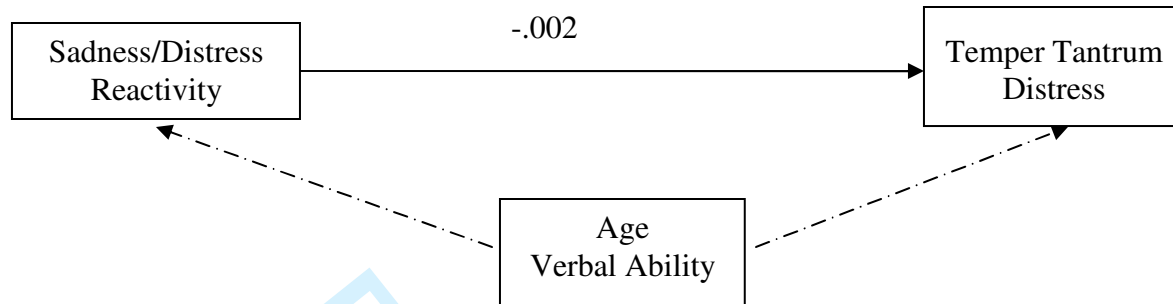
Figure 4. Multiple mediation model of parent reported sadness/distress

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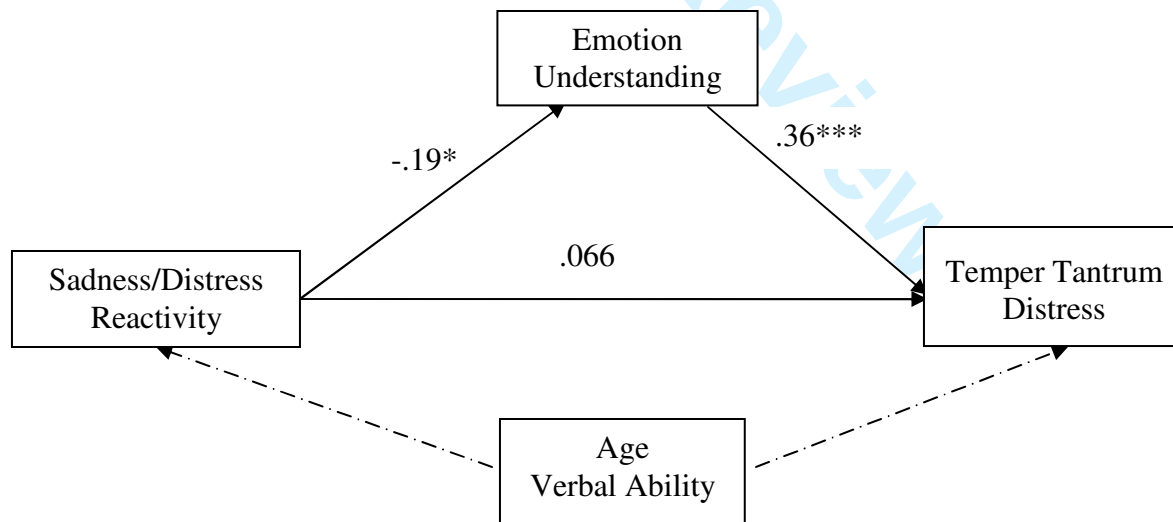
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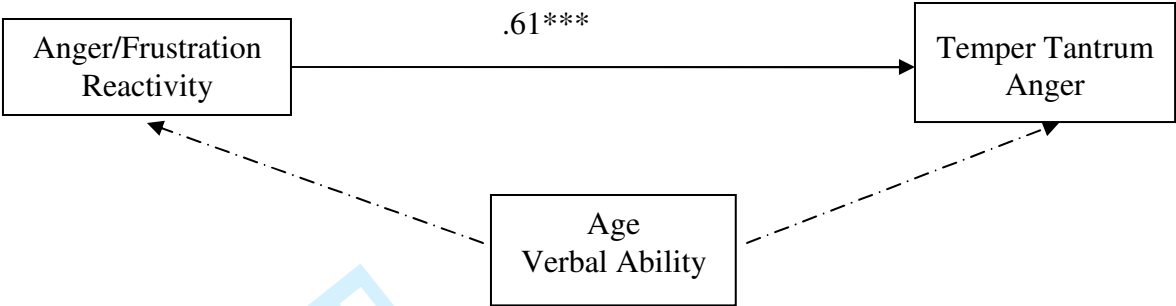
Panel A: Path estimates for the direct effect of sadness/distress reactivity (child measure) on temper tantrum distress (controlling for child age and verbal ability).



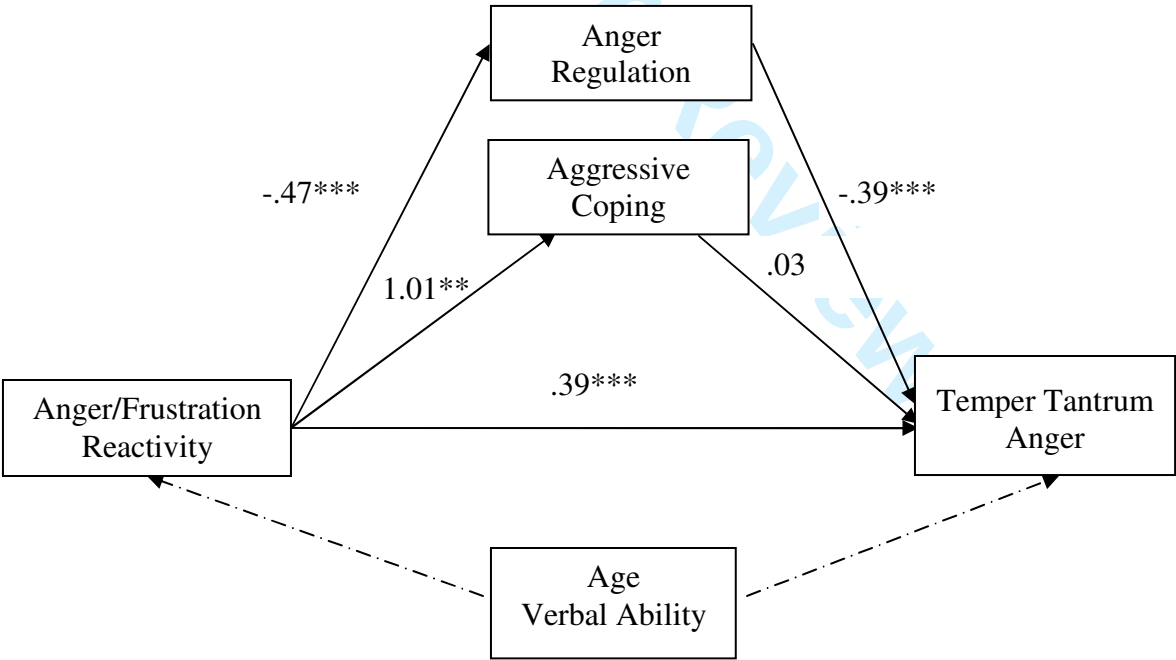
Panel B: Path estimates for the indirect effects of sadness/distress reactivity (child measure) on temper tantrum distress (controlling for child age and verbal ability).



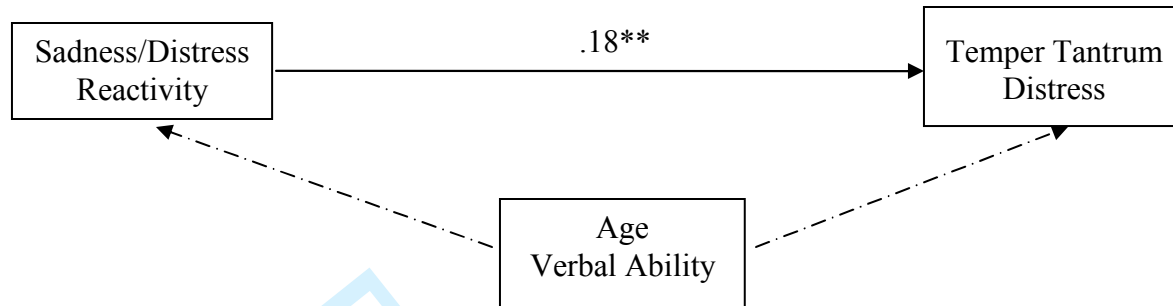
Panel A: Path estimates for the direct effect of parent reported anger/frustration reactivity on temper tantrum anger (controlling for child age and verbal ability).



Panel B: Path estimates for the indirect effects of parent reported anger/frustration reactivity on temper tantrum anger (controlling for child age and verbal ability).



Panel A: Path estimates for the direct effect of parent reported sadness/distress reactivity on temper tantrum distress (controlling for child age and verbal ability).



Panel B: Path estimates for the indirect effects of parent reported sadness/distress reactivity on temper tantrum distress (controlling for child age and verbal ability).

