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Relations of Early Goal Blockage Response and Gender to Subsequent Tantrum Behavior

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Abstract

Infants and their mothers participated in a longitudinal study of the sequelae of infant goal blockage responses. Four-month-old infants participated in a standard contingency learning/goal blockage procedure during which anger and sad facial expressions to the blockage were coded. When infants were 12- and 20- months-old, mothers completed a questionnaire about their children's tantrums. Tantrum scores increased with age and boys tended to show more tantrum behavior than girls. Anger expressed to goal blockage at 4 months was unrelated to tantrum behavior. There was a gender by sad expression interaction. Girls who expressed sadness in response to the goal blockage had lower total tantrum scores than boys; otherwise there was no difference. These results suggest that tantrums of infants who display sad, not anger expression, in response to goal blockage, are differentially influenced by children's gender.

When 2- to 8-month-olds infants learn to expect a response-contingent event, blockage of that event leads to facial displays of predominantly anger, although sad expressions are also observed in some infants (Alessandri, Sullivan, & Lewis, 1990; Lewis, Sullivan, Ramsay, & Alessandri, 1992). Anger expressions in this context are linked to contingency perception and increased instrumental responding associated with the blocked goal. Sad expressions are related to less instrumental responding when the goal is lost (Alessandri, Sullivan, Imaizumi, & Lewis, 1993; Sullivan, Lewis, & Alessandri, 1992). Physiological responses have also been consistent with expression patterns. Heart rate increases in relation to anger, but cortisol does not (Lewis, Hitchcock, & Sullivan, 2004; Lewis, Ramsay, & Sullivan, 2006). Cortisol levels increase with sad expression, but not with anger (Lewis, Ramsay, & Sullivan, 2006a).

Although anger expressions are the predominant response to goal blockage, past work shows that individual differences are apparent. Approximately 30% of infants do not show either anger or sad expressions (Crossman, Sullivan, & Lewis, 2009; Lewis, et al., 2004; Sullivan & Lewis, 2009). Some infants show sadness exclusively (10%), some show only anger (30–40%), and some show both expressions (30%). These individual differences in expression are stable over 24-hour and successive 2-month periods between 2- to 8-months, suggesting that there is some stability of these expression patterns across the first year of life (Crossman, et al., 2009; Sullivan, et al., 1992). This paper explores the meaning of these differences in relation to the general characteristics of toddlers' tantrums.

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The occurrence of both anger and sad expressions in response to the same goal blockage context and within the same individuals is consistent with findings from studies of facial expression during infancy and is of interest in light of recent work on the biphasic structure of children's tantrums. While tantrums have been regarded as uncontrolled anger or nonspecific negative emotion and have some clinical relevance (Potegal, Carlson, Margulies, Gutkovitch, & Wall, 2009), they appear to reflect two distinct emotion processes. The initial emotion component of tantrums is a rapidly rising and falling anger component followed by a sadness/distress component (Potegal & Davidson, 2003). These anger and sadness/distress components, measured as behavioral responses such as_hitting, kicking, stiffening, screaming versus whining and comfort seeking, have differential time courses. Anger occurs as the initial response at tantrum outset. It peaks and declines rapidly while sadness/distress behaviors persist throughout the tantrum duration and subside slowly (Potegal, Kosorok, & Davidson, 2003). Thus, despite the apparent face validity of tantrums as angry outbursts, they reflect two distinct emotion processes.

The goal blockage responses of young infants, like the tantrums of toddlers may involve both anger and sad emotion processes. If so, an interesting question is whether individual variation in goal blockage expressions of either anger or sadness seen among infants (as noted above) show some relation to later tantrum behavior. In our study, we did not examine the time course and sequencing of anger relative to sad expressions during goal blockage in infancy, but we reasoned that individual differences in the occurrence and patterning of anger and sad expressions to goal blockage might be related to similar processes in tantrums and therefore would be reflected in tantrum behavior. Based on the tantrum data and our theoretical view of infant anger in response to goal blockage as an aspect of behavioral approach, we expected that individual differences in the pattern of expression shown to goal blockage (anger, sad, both, or none) would differentially predict both tantrum onset and severity. In developing our hypotheses, we considered tantrums as a normative aspect of emotional development. Since tantrums in normally developing children include both anger and sad processes and since anger is the initial, rapidly peaking and declining component of tantrums, we hypothesized that either showing anger alone or both anger and sad in response to goal blockage would be associated with the earlier onset of tantrum behavior. Infants who focus on goals and persist in attempts to regain them can be characterized as being strongly engaged in the environment and therefore high in behavioral approach. Obstacles and parental restrictions would be likely be encountered earlier in the development of high approach toddlers (Biringen, Emde, Campos, & Applebaum, 1995; Gralinski & Kopp, 1993). Strong approach motives, indexed by anger responses to goal blockage, should therefore lead to earlier tantrum onset.

Conversely, since the sad/distress process may be associated with longer, more distressed-appearing tantrums, and tantrum-prone children show more right frontal EEG activation associated with sadness (Potegal, Kosorok, & Davidson, 2003; Potegal & Stemmier, 2010), we hypothesized that sad expressions to goal blockage, but not anger alone, would be related to parental reports of more severe tantrum characteristics. Although tantrums may initially signal child anger to caregivers, tantrum persistence and the lingering negativity of the sadness/distress component might be more related to parental recollections of tantrum severity.

To test our hypotheses, mothers and their 4- to 5-month-old infants were seen initially in the laboratory for assessment of goal blockage responses. To obtain information on tantrum onset and characteristics, we assessed tantrums via maternal report at 12 and 20 months of age. These ages were chosen because the earliest reports of tantrums occur as children begin independent locomotion with peak negativity at about 18–20 months in both retrospective and prospective developmental data (Brownell & Kopp, 2007). Mothers were asked

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specifically about the occurrence of tantrums at each age, the behaviors observed, and the contexts in which they occurred. In this way we could examine differences in the developmental trajectory of tantrum characteristics over age as a function of infants' earlier goal blockage responses.

We also explored tantrum differences as a function of the child's gender. A review of the data found little evidence for gender differences in infant anger or tantrums in the first year of life, although boys generally show more tantrum behavior after 21 months of age (Potegal & Archer, 2004). Potegal & Archer (2004) note that this difference may be confounded by the inclusion of aggressive behavior, including hitting, biting, or kicking others, in their tantrum definitions since anger may arouse aggressive responses more easily in boys. Violence during tantrums also appears to distinguish preschoolers with a disruptive diagnostic classification from healthy children, however boys and girls were equally represented among this group (Belden, Thomson, & Luby, 2008). In considering gender differences in early infant anger, sadness and general negative reactivity, reports of sex differences have been inconsistent. On average when differences are observed, studies tend to report male infants may be more irritable and active, less able to regulate physiologically, but more active, and able to enjoy high intensity pleasure while female infants are often reported to smile more socially, and may show more low intensity pleasure, while boys are more active (Maccoby & Jacklin, 1974; Calkins, Dedmon, Gill, Lomax, & Johonson, 2002; Campbell & Donovan, 1999; Weinberg, et al., 1999). As sample sizes in many studies reporting sex differences are often small and in light of the inconsistency across studies, it seems parsimonious to conclude that gender differences in negative emotion are unlikely in the first months of life. In contrast, the literature has consistently found that parents respond differentially to boys and girls from the first months of life and that gender-based differences in the socialization of emotion and many aspects of social behavior in infants have been reported (Donovan, Taylor, & Leavitt, 2006). Based on these findings, we expected there would be no differences between boys and girls in tantrum onset or in tantrum characteristics at 12 months, but by 20 months, we expected boys to show more severe tantrums.

METHOD

Participants

A sample of 90 infants (40 boys and 50 girls) and their mothers were recruited for this exploratory longitudinal study of the effects of infant goal blockage responses. Mothers of healthy newborns were recruited during their post-partum stay at a regional teaching hospital. Following initial recruitment, mothers were contacted again when their children were 4.5 months of age (*M = 17.59* weeks, *SD* 1.24) to schedule the laboratory visit. At 12 months, 95% of the infants were walking, suggesting that their motor development was typical.

The sample was predominantly of white/European ancestry but included diverse cultural groups: African American (10%), East Asian (2%) and Hispanic (8%). First-born children comprised almost half of the sample (47%); 33% were second-born, and the remaining 20% of the children were later born. All but one mother had at least completed high school. Although mothers were the infants' primary caregivers, 50% of the sample had some daycare arrangement by 12 months.

Of the 90 infants enrolled initially, 76 completed the laboratory at 4 months, 88 mothers reported on tantrum behaviors at 12 months of age, and 82 reported on the infants at 20 months of age[1]. Participants were included in the analyses if they had both infant and 20 month data (N=74). Participants who contributed data at all three time points did not differ

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from those who did not on the following demographic variables: maternal education (*M* =14.88 years; *SD =2.4*); maternal ethnic/cultural group, and birth order. Temperament dimension scores on the Infant Behavior Questionnaire (Rothbart, 1981) did not vary by the number of completed visits (See Table 1). Therefore babies who missed visits were not more likely to be fussy. However, participants with only one data point (n = 6) were male. There also were no differences between boys and girls in ethnicity, maternal educational level, birth order, temperament, infant age or the percentage having a daycare arrangement at any data collection point.

Procedure

Goal blockage expressions—Infants participated in a standard contingency learning/ goal blockage procedure. They were seated in a booth facing a screen and wore an elastic wristlet on their right arm, which connected via a ribbon to a switch mounted behind the booth's wall. Each received 2 minutes of baseline (no stimulation). This was followed by 6 minutes of contingent stimulation. During this phase, infants' pulling on the ribbon activated a 3-sec display of a colorful picture of a happy baby's face with music. Six minutes of contingency exposure was used since previous work has demonstrated that a majority of infants will exceed a minimum learning criterion within this period (Sullivan & Lewis, 2003). The contingency phase was followed by a 2-minute period with no stimulation. During this phase, pulling on the ribbon no longer produced the stimulus event, constituting blockage of the contingency goal (Crossman, et al., 2009; Lewis, et al., 1992; Sullivan & Lewis, 2003).

We videotaped infants' facial expressions throughout the entire procedure. We scored expressions only during goal blockage because previous studies have shown that as long as infants respond to the contingency, few negative expressions occur during this phase (Sullivan & Lewis, 1989). Individual differences in negative facial expressions were observed during the goal blockage period (Lewis, et al., 1992; Sullivan & Lewis, 1989). The goal blockage segments were scored second-by-second in slow motion without sound. Using the Maximally Discriminative Facial Movement Coding System–MAX (Izard, 1995), anger and sad facial expression components (or the lack thereof) were scored in the upper and lower facial regions. These codes were then tallied across the goal blockage phase using a macro. Expressions were defined as either full or partial MAX anger (Codes: 25-33-54 or 55; 25-33-00) or full or partial MAX sad (Codes: 23-33-56; 23-33, 00) to insure that expressions of at least moderate intensity were scored. Single movement codes were not counted.

Coders were trained on a previously scored set of tapes from another study. They first established reliability on each facial region and then coded study tapes to a criterion of 85% or better inter-rater agreement. Reliability was subsequently checked by double coding 25% of the tapes. Coding of each facial region was reliable and significantly greater than chance ($K \geq .70$).

Goal-blockage (GB) group—Following coding, infants were assigned into goal-blockage groups based on the pattern of anger or sad expression observed during the goal blockage. That is, infants were grouped according to whether they had shown anger expressions only (30, 45% male), sad expressions only (7, 58% male), both (14, 69% male), or neither expression (23, 48% male).

[1]The 14 infants without emotion data at 4 months were either too fussy to complete the lab procedure (10) or could not be seen within the age window for this visit (16 weeks ± 2) because of cancelled appointments.

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Infant Temperament—Mothers completed the Infant Behavior Questionnaire (IBQ; Rothbart, 1981), rating their infants' temperament during their first visit to the lab (i.e., when goal-blockage emotion was assessed). Ratings yielded scores on the following scales: activity, pleasure, distress to novelty, interest (duration of orienting) distress to limits, and soothability.

Tantrum Questionnaire—Mothers completed the same tantrum questionnaire when their children were approximately 12 (*M* =12.22; *SD* 0.99) and when the children were 20 months old (*M* =19.66; *SD* 0.56). The questionnaire was developed for this study and included general developmental information about the child as well as questions specific to the toddler's temper tantrums. We did not explicitly define tantrums for mothers. Instead, mothers were first asked whether their child had yet displayed anger (98% of the mothers responded affirmatively to this question) followed by the question “Has your child had any temper tantrums yet?” If the response was “Yes”, mothers reported how old their child was when temper tantrums first began; how frequently tantrums had occurred in the last week on a 7-point scale (none, less than once, once, 2–3 times, almost every day, every day, more than once per day), and to describe how the child behaved during the tantrum. To allow mothers to describe tantrums, we provided a list of 6 common tantrum behaviors reported in the literature for mothers to endorse (screams/intense crying, whines/fusses, angry glare/face reddens, kicks things or stamps feet, throws self down/arches head or back, throws or bangs things). They could also add any additional behavior they wished to this list (an “Other---please describe” response), although few did. Aggressive behavior toward others was not included in the list but was assessed in a separate question. The incidence of aggressive behavior was very low and was not included in the final tantrum scaling. Mothers also reported on the contexts in which tantrums were likely to occur using a checklist of common situations associated with negative affect in toddlers. The situations were: not getting a desired object, not getting attention, being left by a desired person, over-tired/bedtime, clothing or diaper change, bothered by a sibling or other child), plus “other” for any that they wished to add (e.g., not feeling well).

Tantrum measures—Tantrum onset was defined as the age in weeks at which the child first displayed a recognizable tantrum. The correlation for age of onset across administrations of questionnaire in mothers who reported at both ages was .65 ($p < .01$) and indicated moderate stability of maternal reports. That is, despite differences in the specific age of onset reported, mothers who reported that their child showed an earlier tantrum onset at 12 months, also tended to report earlier onset at 20 months.

To obtain tantrum scores, the frequency of tantrums reported, the number of behaviors typically observed and the number of different contexts in which tantrums typically occurred were also tabulated for each child. The cross-age correlations between maternal reports of these three tantrum variables were frequency, $r = .33$, number of contexts, $r = .44$, behaviors, $r = 69$, all $p's \leq .05$. This level of correlation was consistent with other reports (Gindin, Bisson, Green, & Potegal, 2010) and suggested, as with the onset measure, that there was moderate stability of maternal report of tantrum characteristics over age. The within age correlations of the reported tantrum characteristics also was moderately high (See Table 2).

Given the degree of within age correlation between the tantrum characteristics, it was reasonable to reduce them to a single summary score at each age in order to obtain the most reliable maternal report of perceived tantrum characteristics. The three variables were converted to standard scores (*z-scores*) and summed within age to yield a tantrum score at each age. A higher score reflected more severe and more prevalent tantrums.

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RESULTS

Preliminary analyses established that there were initially no differences in the goal blockage response of boys and girls overall or by emotion goal blockage group. The mean levels for each of the raw tantrum variables and the summary scores at each age are presented in Table 3. The median age of tantrum onset for those children who had reportedly displayed tantrums on the 12-month questionnaire was 52 weeks. Although many mothers reported that their children were showing tantrums at this age and nearly all mothers acknowledged that their infants expressed anger, 45% of mothers reported no tantrums at this age. The modal frequency of those who had started having tantrums was low, less than one per week. Therefore, the 12-month measure was converted to a dichotomous variable in order to assess tantrum onset at this age. By 20 months, however, only 20% of the sample had not yet shown tantrums, so continuous reports of onset were retained.

We also undertook preliminary analyses to see if temperament was related to any of the variables. There was little evidence that either goal blockage group or infant gender influenced temperament ratings. There were no main effects of gender or emotion group on IBQ ratings, with the single exception of a gender difference in Smiling/Laughter favoring females ($p < .05$). Females had higher ratings on this dimension, as is sometimes reported. There were also no group by gender interactions predicting any of the IBQ dimensions (All p values exceeded .21, except soothability where $p < .08$. Mothers reported that girls who expressed sadness tended to be more soothable girls who did not express sadness, $p = .10$, while among boys there was no difference). In addition, tantrum onset, tantrum variables and the composite were uncorrelated with maternal IBQ temperament ratings. Therefore the influence of temperament was not considered further.

Tantrum onset at 12-months

We used *chi-square* to examine the association of goal blockage group and gender with the presence or absence of tantrums in toddlers at 12 months due to the nature of the distribution. There was no difference by group in the percentage reporting tantrums by 12 months. There was no gender difference; 55% boys versus 45% girls displayed tantrums by 12 months. There also was no difference in the reported mean age of onset of by either group or gender.

Tantrum onset at 20-months

We used a mixed model analysis with fixed factors of goal blockage group and child gender to focus on the influence of these variables on tantrum onset. Because tests of fixed effects in mixed models do not have exact F distributions, the denominator degrees of freedom are not integers. In SPSS, they are obtained by a Satterthwaite approximation (West, 2009), the method used by statistical packages such as SPSS, SAS, and Stata.

Figure 1 shows the means and standard errors for tantrum onset, broken down by goal blockage group and sex. Girls had earlier tantrum onset than boys overall, $F(1,67) = 3.94$, $p < .05$; $\eta^2 = .06$. The average difference was 8 weeks, *Cohen's d* = .57. The group by gender interaction was not significant.

Tantrum scores

To assess change in the tantrum over time, we again used a mixed model analysis with fixed factors of goal blockage group, child gender and age included as a repeated measure. To conserve power, we retained only 2-way interaction terms in this model. We first examined each of tantrum variables separately. As the pattern of significant age effects was the similar across all three variables in these analyses and each also showed either significant gender

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(frequency) or gender by age interactions (contexts; behaviors), only the analysis of the summary score will be reported in detail.

Figure 2 shows the developmental trajectory of tantrum summary scores between 12 and 20 months as a function of the group. Tantrums increased in all groups over time; $F(1,127.25) = 22.00$, $p < .001$. There was no interaction with goal blockage group. The mean increase in the tantrum score between 12 and 20 months was 3.18 ($df = 127.10$), $p < .001$; *Cohen's d* = .47.

There was no main effect of goal blockage group on tantrum scores. However the tantrum scores of the sad group tended to be lower overall and had a wider confidence interval as shown in Table 3.

Boys and girls differed in their tantrums scores. Boys had higher tantrum scores in general ($M = 5.18$, $SE = .44$ vs. $M = 3.10$, $SE = .56$; *Mdiff*=2.08, $p < .005$; *Cohen's d = .42*). This difference was unaffected by age, but there was a gender by group interaction; $F(1,131.88) = 4,12$, $p < .01$. As shown, in the figure, boys and girls differed in their tantrum scores in two of the groups (Sad only, Anger and Sad). That is, groups differed in their tantrum scores if any sad responses had occurred to goal blockage at 4 months; Sad alone: $F(1,130.45) = 2.11$, $p < .10$, *Cohen's d* = .20 and Anger with Sad: $F(1, 125.47) = 6.14$, $p < .02$; *Cohen's d = .50*. In each case, boys had higher tantrum scores and girls had lower. To explore these findings, we regrouped the data, collapsing the Sad and Both Anger with Sad groups to reflect the presence/absence of <u>any</u> sad expressions to goal blockage at 4 months. This resulted in a dichotomous grouping of No Sad (49% male) versus Any Sad (% 66 male) for the mixed model. These data are shown in Figure 3. The Sad Group by gender interaction remained significant; $F(1, 130.72) = 12.07$, $p < .001$). Boys and girls who had shown sad responses to goal blockage as infants differed with respect to their tantrum behavior as toddlers; *Mdiff* = 3.47, $SE = .90$, $p < .005$, *Cohen's d = .99*. In contrast, boys and girls who had <u>not</u> shown sad responses to goal blockage were similar in their tantrum behavior. Girls who had shown sad responses to goal blockage had lower tantrum scores than girls who had not; *Mdiff* = −2.42, $SE = .88$, $p < .01$, *Cohen's d* = .77. Boys' tantrum scores did not differ as a function of sad responses to goal blockage. In other words, boys' higher tantrums scores were not a function of their having shown early sad expression but girls lower tantrum scores were a function of their having expressed sadness to goal blockage as infants. To explore whether this finding could be explained by the observed group by gender interaction in IBQ soothability reports, *ANCOVA*s were conducted examining gender differences controlling for soothability. Among those infants who expressed sadness to goal blockage, girls had lower tantrum scores than boys; $F(1,27)= 5.80$, $p < .05$; $\eta^2 = .19$, *Cohen's d* = .93. The sex difference thus remained significant, while controlling for soothability. Boys and girls who did not show sadness did not differ in their tantrum scores.

To further explore confirm that anger at 4 months was unrelated to subsequent tantrum behavior, follow-up analyses also were undertaken using the amount of anger responses to goal blockage. We regrouped the data to reflect three levels of anger expression to goal blockage at 4 months (None, Low Anger, High Anger), with low vs. high determined by a median split of those infants showing any anger. There were no main effects of anger response on tantrum scores at either age, or an interaction with child gender. Thus, higher anger to goal blockage was unrelated to tantrum scores.

DISCUSSION

In this study, we explored potential associations between early goal blockage responses and subsequent tantrum behavior. We also examined gender differences in tantrums, asking

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whether they emerged over time or interacted with earlier response patterns. We expected differences in tantrum characteristics by goal blockage emotion such that 1) tantrum onset but not tantrum scores would be greater in those infants who expressed anger to goal blockage and 2) higher tantrum scores would be observed in those infants who expressed sadness to goal blockage. We also expected a gender by age difference in tantrum scores such that boys would have higher scores by 20 months. We found the expected main effect of age. However the findings for gender and emotion group were not as expected.

The data on tantrum onset was consistent with reports that tantrums may begin around 12 months of age in some toddlers. While the peak negativity of the “Terrible Two's” occurs by 18–24 months, our data confirmed that parents recognized some negative outbursts as tantrums by about 12 months in some children and that all groups showed a similar trajectory of increased tantrums by 20 months. By the end of the second year as expected, tantrums were more frequent; more behaviorally elaborate, and occurred in more contexts on average. We characterize the increase in tantrum behaviors over time as more elaborate because parents are reporting additional, not different, behaviors over time. At 12 months, 90% of mothers endorsed screaming/intense crying as indicative of tantrums and it was the sole criterion. By 20 months, they endorsed screaming/intense crying plus other behaviors, although the specific behaviors endorsed varied across the sample. Thus, more behaviors are reported over time rather than a change in what signals a tantrum.

Gender emerged as a factor in our data, despite the fact that we observed no differences in goal blockage emotion, temperament, or their interaction among girls and boys initially. There were two main effects: We observed an earlier onset of tantrums in girls and found the expected overall difference in tantrum scores favoring males. Girls had earlier tantrum onset based on the 20-month report and this effect was unmodified by their earlier goal blockage response pattern. No gender difference was reported at 12 months, although only about half the sample was showing tantrums with any frequency at that age. Since there were no gender differences in initial emotion to goal blockage, temperament, or socio-demographic characteristics, it may be that mothers were more sensitive to negative emotion in their daughters and so perceived earlier tantrum onset. Alternatively, girls in this particular sample may have differed on other unmeasured variables such as locomotor ability, language, or attention. Gender data on tantrum onset is limited in the literature, so this finding requires replication.

Boys' higher overall tantrum scores confirm previous reports in the literature which report gender differences later in the second year. It seems reasonable to expect that gender differences in tantrums might be observable as soon as independent walking emerges, since restrictions are likely to be placed on toddlers at this age and boys are typically more physically active (Campbell & Eaton, 1999).

There are two somewhat divergent views of tantrums in the developmental and clinical literature. Tantrums are viewed on the one hand as normative behavior, whose occurrence can mark positive aspects of development such as mastery and independence. In contrast, persistent tantrums can mark clinical risk of mood disorders (Belden, et al., 2008; Dix, Stewart, Gershoff, & Day, 2007). Tantrums also have face-validity in the popular media as anger displays. Anger also can be viewed as an approach emotion due to its positive developmental correlates and function of maintaining goal-focus (Harmon-Jones & Gable, 2009). Because we view tantrums in this sample as a normative response to thwarted approach behavior, we proposed that anger to goal blockage would be related to tantrum onset, rather than the tantrum summary score, a gross index of tantrum severity. Our findings show that early differences in anger expression to goal blockage were unrelated to

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either measure. Instead, sad responses to goal blockage were related to tantrum scores, but only as a function of the children's gender.

Sad responses to goal blockage were related to the lowest tantrum scores in girls. The gender interaction remained significant after the two goal blockage groups including sad expressions were collapsed to yield larger cell sizes and the trend for greater perceived soothability of girls was controlled. Since neither boys nor girls were more likely to show sad expressions to goal blockage initially, pre-existing gender differences in expression do not account for these findings. Female vulnerability to sadness has been reported but not until later childhood (Egger & Angold, 2006). In this meta-analysis of gender differences in temperament from 3 months to 13 years, there were small but reliable gender differences favoring boys for the difficulty and intensity dimensions of negative affect whereas the fear and distress dimension of negative affect showed a small difference favoring girls. Thus, it may be that boys are more likely to show more frequent or more severe tantrums, but girls might be more easily distressed. Girls also showed evidence in the reviewed studies of greater effortful control, or the ability to regulate one's attention and impulses. Toddler's effortful control within a delay task has been shown to at least partially mediate the relation between supportive parenting and low levels of externalizing problems and separation distress between 18 and 30 months, but gender effects were not discussed in this study of 256 children (Spinrad, Eisenberg, Gaertner, et al., 2007). Although we did not collect data relevant to this point, other than the IBQ Duration of Orienting, which showed no gender effects or interactions, there is a body of research on infants and toddlers suggesting that girls may develop some aspects of emotion regulation earlier than do boys. For example, Stifter and Spinrad (2002) reported that typically crying girls showed significantly more self-regulatory behavior than excessively crying boys at 10 months. Three-year-olds girls also may engage in more self-comforting, and so be better at the down-regulation of anger and sadness (Zimmerman & Stansbury, 2003). Such factors conceivably might facilitate less tantrum behavior in girls in the toddler and early preschool years.

Social or emotion-focused, rather than attention-focused, explanations for the pattern of gender differences are also possible. If girls show greater sadness, it is possible that their sadness elicits increased caregiving from caregivers, which serves to help them learn to regulate their emotions better than boys as they mature. It is also possible that early sad expressions to goal blockage may index different emotion processes in girls and boys. Sad expression to goal blockage in female infants may index lower irritability in females. Sadness to goal blockage in male toddlers did not differentiate those with higher tantrum scores, and so, showing sad expressions to goal blockage may be a normal expression variant in boys' early emotional development related to concurrent irritability, but unrelated to later tantrum severity.

Girls' lower tantrum scores do not necessarily imply that sad expressions to goal blockage early in life are beneficial or are protective of subsequent tantrums. Early sad expressions in girls may be related to other gender-linked developmental factors. For example, girls who display sadness as infants may be more advanced in their language development at 20 months and so avoid tantrums through better receptive and expressive language that may allow for verbal control of behavior. Our finding may have inadvertently replicated a set of findings by Goldberg & Lewis (1969) and Feiring & Lewis (1979) on sex differences in toddlers' behavior at a barrier. They reported that girls and boys showed differential behavior in response to a barrier at both 12 and 24 months. At 12 months, girls were likely to cry when placed behind a barrier separating them from their mothers, but by 24 months, they were more likely than boys to ask for help to overcome the barrier. Unfortunately, we have no language measures, so this explanation is speculative, but also might account for why tantrums in girls may be perceived as less severe by 24 months. Finally, it remains

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possible that sad responses are related to passivity or down-regulating (withdrawal) behaviors that in conjunction with negative reactivity predict later behavioral inhibition and anxiety that might account for suppressed tantrums (Calkins et al., 2002; Stifter & Spinrad, 2002). While there was no gender difference in distress to novelty, the closest proxy for behavioral inhibition assessed in this study, the observed trend toward greater maternally reported soothability for the girls in this sample, lends weak support to this idea. That is, greater down-regulation of activity and/or emotion, perhaps perceived as greater soothability by mothers, may be reflected in girls' lower tantrum scores. Although the gender difference remained when soothability was controlled, further study should examine the relatedness of down-regulation in emotion and activity to gender differences in perceived temperament.

Where do these differences come from? To date, there have been inconsistent reports of gender differences in emotion in early infancy, and none within the contingency goal blockage procedure. Gender differences in tantrums, despite their earlier absence in response to goal blockage, suggest that gender becomes increasingly important during the period between 5 and 12 months, likely as a result of gender-related differences in dyadic interactions and socialization (Campbell & Eaton, 2006; Donovan et al., 2006; Maccoby & Jacklin, 1974). As to the origins of initial differences in goal blockage expressions, there is not yet any evidence that these differences are shaped directly by mothers. However, the influence of the early social environment on anger and sadness emotion processes in infancy has not yet been ruled out. The finding of gender differences in tantrums by 12 to 20 months in this study is another hint of the potential moderating impact of emerging social influences on early emotional behavior.

Are maternal reports of tantrum behavior sufficiently reliable to draw any conclusions about continuities in early goal blockage response to tantrums? While direct, observation of behavior confirming parent reports are always desirable, tantrums are highly salient, often aversive events for parents, who clearly attend to and may express concerns about them. The tantrum measures in this study were based on maternal reports of tantrum behavior but they are consistent not only with previous reports, but also with naturalistic data on tantrums (Potegal & Davidson, 2003). Within this study, data on the consistency of maternal ratings was also collected and showed moderate cross-age stability from age 12 to 20 months. This convergence suggests that maternal reports on the nature and quality of children's temper tantrums are reliable when they are asked to report on specific behaviors. The moderate level of cross-age correlation may stem from the normal age-related increases in tantrums during the second year, rather than solely problems with maternal reliability itself. Mothers are rating changing behavior which itself may be somewhat unstable. Although memory error likely plays some role in these behavioral reports, this may have been offset by asking mothers about concurrent behavior and over a relatively short time span. With regard to the age of onset reports, taken at 12 months when tantrums were just emerging and again at 20 months when they were prevalent for most children, memory error remains an issue. Since we asked mothers to report the age in weeks when in their estimation tantrums first began, the age of onset reported at 20 months is likely to be more prone to memory error, since mothers have to remember back as much as 10 months at this age, whereas at 12 months, they are likely considering behaviors within the last month or two at most. In future studies, greater precision should be sought for this variable, perhaps through diary records, or repeated calls through the likely age of tantrum onset.

In conclusion, this exploratory study of differences between early emotion patterns in response to goal blockage and tantrums shows that their relation is influenced by children's gender. Early anger responses to goal blockage were not predictive of earlier or more tantrum behavior for either boys or girls, although girls showed earlier tantrum onset and boys showed more tantrum behavior overall. Instead, sad responses to goal blockage, a

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measure associated with withdrawal from blocked goals was associated with lower tantrum scores in girls. This suggests that the predictive validity of sad responses to goal blockage may differ for boys and girls, although why this is so requires further study. While our study is limited in that the sample size is modest, the cell sizes are unbalanced with respect to the gender distribution of those showing sadness, and the tantrum questionnaire relies on maternal report, the data suggest that differences in early expression patterns and gender related to tantrums may emerge by the second year. In addition to replicating these findings, future work needs to address the social and developmental processes between 5 and 12 months that might promote relations between gender and tantrums. In particular, more detailed behavioral data on emotion sequences with tantrums in relation to earlier goal-blockage responses may yield insights on both anger and sad reactivity and regulation.

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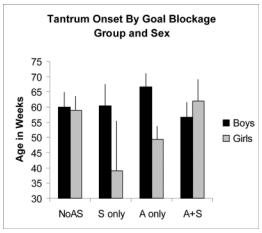

Figure 1.
Sex and goal blockage group differences in tantrum onset

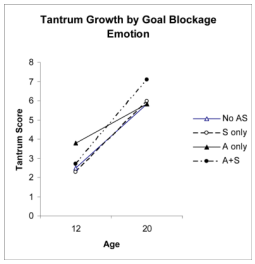

Figure 2.
Tantrum growth from 12 to 20 months by goal blockage group

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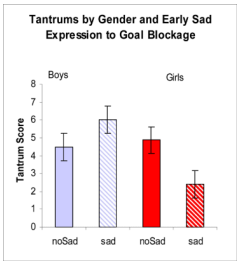

Figure 3.
Tantrum scores as a function of children's sex and goal blockage group

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Table 1

IBQ Temperament Dimension Scores at Four Months by Number of Completed Visits

	Distress to Novel			Distress to Limits			Duration of Orienting			Activity Level			Smiling/Laughter			Soothability		
Data Points[a]	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
N	6	25	59	6	25	59	6	25	59	6	25	59	6	25	59	6	25	59
M	3.18	3.34	3.26	3.70	3.72	3.65	4.14	4.10	4.10	4.48	4.10	4.37	5.0	4.82	4.77	5.30	4.95	5.07
S. D.	.88	1.31	1.34	.81	.68	.717	.82	.90	1.02	.473	.67	.60	.73	.78	.83	.50	1.01	1.06
S.E,	.30	.28	.131	.27	.11	.07	.24	.14	.10	.15	.10	.06	.24	.12	.08	.17	.17	.10
95% C. I.	2.49	2.92	3.00	3.07	3.50	3.51	3.51	3.81	3.90	4.14	3.90	4.25	4.39	4.57	4.6	4.89	4.61	4.87
	3.86	3.76	3.51	4.33	3.93	3.79	4.78	4.39	4.30	4.82	4.30	4.49	5.52	5.07	4.93	5.71	5.29	5.27

[a]Participants with a single data point had only 4-month data. Participants with 2 data points had 4-month and either 12 or 20-month data.

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Table 2

Correlations between tantrum variables at 12 and 20 months.

	12 Months	20 Months
Tantrum Frequency with:		
Number of Contexts	.67**	.57**
Behavioral Intensity	.74**	.73**
Behavioral Intensity with		
Number of Contexts	.83**	.72**

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Table 3

Means and standard deviations for raw tantrum variables and composite scores at 12 and 20 months

Age	Age in Weeks at Tantrum Onset	Tantrum Frequency	Number of Contexts	Number of behaviors displayed	Raw Summed Score
12 mo	52.94[a] (15.21)	1.2 (1.71)	1.00 (1.12)	0.85 (1.11)	3.84 (3.70)
20 mo	58.11 (16.08)	2.09 (1.82)	1.68 (1.33)	1.73 (1.36)	5.75 (3.81)

[a]Mean for those children for whom tantrums had occurred (N=52).

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