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Young Children's Post Tantrum Affiliation With Their Parents

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In our database of 331 parental narratives of tantrums had by children 18–60 months old, 29% of the tantrums were followed by child-initiated affiliation with parents. Four variables increased the probability of children's post tantrum affiliation (PTA): age, prolonged screaming, physiological stress, and parent-initiated separation from the child during the tantrum. The age effect may be due to increasing post tantrum persistence of negative affect, to the emergence of shame, guilt, and embarrassment over this developmental period, and/or to increasing cognitive ability, empathic capacity, or socialization. Screaming, which may be analogous to the defensive vocalizations of nonhuman primates, increases PTA when prolonged for 6 min or more. Physiological stress (indicated by autonomic activation or respiratory distress) appears linked to prolonged screaming and may mediate its effects by increasing the child's dysphoria and need for consolation. Separation (parents' departure from the scene of the tantrum or their imposition of a time out) also appears linked to prolonged screaming and may reflect parents' response to an aversive auditory stimulus. There was no evidence that PTA was associated with the presence or degree of physically expressed anger in the tantrum. PTA may be associated with distress during the tantrum. The post conflict reconciliation which occurs in several domains of human social life may be first experienced by children in the aftermath of their tantrums. Aggr. Behav. 23:329–341, 1997. © 1997 Wiley-Liss, Inc.

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INTRODUCTION

The phenomenon of reconciliation following an agonistic encounter was formally identified in chimpanzees by de Waal and van Roosmalen as recently as 1979. As the papers in this special issue of *Aggressive Behavior* indicate, interest in this phenom-

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enon is still increasing and expanding to include analogous processes in humans. Our own interest in this phenomenon was piqued by a finding in Einon and Potegal's [1994] survey of tantrums in Great Britain in which 35% of tantrums were reported to end in a cuddle. In some cases, parents consoled children who apparently accepted this consolation passively. However, in other cases, the reports suggested that the cuddle was solicited or initiated by the child. Children's techniques for doing so included approaching the parent (almost always the mother), leaning against her, raising arms up to her, or clutching her legs [Kopp, 1989; Parens et al., 1987]. Older children sometimes apologized verbally or announced, "I'm done" (with the tantrum). After his mother had carried him screaming from a shop, a 3-year-old English boy demanded, "Mummy, say sorry" [Einon and Potegal, 1994]. In this economical three-word utterance, the child cleverly managed the pressure to reconcile while simultaneously trying to lay off the blame for his tantrum. Accounts of children making amends by visibly complying with the previously resisted demand appear to be another variant of post tantrum affiliation (PTA). Also noted immediately after tantrums were sucking on a thumb or pacifier and/or the cuddling of a favorite blanket or soft toy [Winnicott, 1953: "transitional objects"]. Increases in young children's use of such objects during periods of anxiety and distress are reviewed by Litt [1986] and Kopp [1989].

Some children affiliate after tantrums and/or show self-consolation; many do not. The modal post tantrum response is for the child to behave "as if nothing had happened." What determines the probability of PTA? Variables of several sorts are of potential interest: status variables (age, sex), chronic behavioral characteristics (e.g., mean tantrum frequency and duration, temperament), tantrum precursors (child's mood before the tantrum, the conflict which triggered the tantrum), intratantrum variables (e.g., child's behavior and autonomic activity during the tantrum), and parental behavior. Among the intratantrum variables, autonomic activity is of particular interest since physiological arousal has been proposed to play a role in appeasement in humans [Leary and Meadows, 1991] and reconciliation in nonhuman primates [Aureli, 1997]. Interest in the autonomic concomitants of children's emotions dates at least as far back as Malapert [1902] who found that 47% of French school children reported facial flushing when angry. More recently, Stenberg and Campos [1990] reported that greater than 90% of 4- and 7-month-olds flushed during anger-inducing restraint. Blurton-Jones [1969] has commented on the occurrence of flushing in tantrums induced by agonistic interactions in preschoolers. The facial autonomic signs visible to parents during a tantrum are an exception to the rule of dual innervation. Facial flushing and sweating are sympathetically mediated [Drummond and Lance, 1987] while sialorrhea (drooling) and rhinorrhea (runny nose) are parasympathetically mediated [Cauna et al., 1972]. This provides a natural grouping for data analysis.

The Einon and Potegal [1994] survey was exploratory and was not organized to provide detailed answers to the preceding questions. The present paper, based on a more extensive survey carried out in the American Midwest, addresses these questions. Our ongoing analysis of this survey data [Potegal et al., 1996] suggests that tantrums consist of at least two partially independent emotional/behavioral processes: anger and distress. Stamping, throwing things, hitting, kicking, pulling, and pushing are gross, vigorous behaviors; their characteristic time course has a probability peak at the onset of the tantrum. Our multidimensional scaling and principal components analyses of

time course [Potegal et al., in preparation] show that, in fact, the parameters of these particular behaviors cluster in parameter space and that the parameters of other behaviors (e.g., running away and throwing oneself down) are at considerable distances. Interestingly enough, the literature on reconciliation indicates that in some species it is the instigator, rather than the recipient of aggression, who typically initiates reconciliation [de Waal, 1993]. From the supposition of a similarity between anger in humans and aggression in other animals [Blanchard, 1984], it follows that the likelihood or intensity of affiliation after a tantrum may be a function of the degree of physical anger expressed by the child during the tantrum.

Distress in tantrums is reflected in crying and, perhaps, other behaviors. An important characteristic of the time course of these behaviors which distinguishes them from anger is that their probability grows over the course of the tantrum. Einon and Potegal [1994] identified a sobbing phase in tantrums which they suggested might involve feelings of guilt or embarrassment. We now think of this phase as a point where the anger process is diminishing and the distress process has intensified. Initiating or soliciting verbal and/or physical interaction is a request for proximity, contact comfort, and reassurance which is intuitively linked to distress [Kopp, 1989]. Thus, a very reasonable alternative to an anger-reconciliation linkage is the hypothesis that it is distress during the tantrum which drives affiliation afterward. This implies that the longer and the more intense the distress experienced during the tantrum, the more probable and/or intense the PTA. This report examines the relative strengths of the coupling of PTA to physical anger and distress.

MATERIALS AND METHODS

Subject Selection

The names of parents of children between 18 and 60 months old were obtained from the Waisman Center for Human Development and Mental Retardation which collates newspaper announcements of Madison area births. These lists represent a large sample of Madison area in-hospital births. To highlight changes in tantrum characteristics with age, we selected noncontiguous age groups of children; i.e., children who were 18–24, 30–36, 42–48, and 54–60 months old. Data were collected in two steps.

Step 1: telephone interview. After obtaining permission to conduct an interview, undergraduates trained in interview techniques first determined if the selected child had tantrums defined as episodes of dropping to the floor, shouting, screaming, crying, pushing/pulling, stamping, hitting, kicking, throwing something, or running away more frequently than once per month. Parents were then asked questions about the incidence, frequency, duration, and general behavioral characteristics of tantrums. Pouting, whining, and angry or sad expressions were not counted as tantrums. By the end of Step 1 we had interviewed the parents of 1,219 children, of whom 991 were classed as tantrumers.

Step 2: descriptive narratives. At the end of the telephone interview, parents were asked if they would prepare a written description of one of their child's tantrums. The packet sent to parents included a page of general instructions, a narrative form, and two "representative" tantrum narratives which we wrote to indicate to parents the level of detail to provide. Emphasis was placed on describing the sequence of behavioral events. The order of events in one of the representative narratives was deliberately different

from that expected in order to reduce the bias introduced by these examples. An ordered checklist of tantrum behaviors was included on the back of the narrative form to clarify and confirm the events described. A separate column on the narrative form was provided for reporting markers of physiological stress: autonomic activity (sweat, salivate/drool, runny nose, turn pale [or red or blue], urinate, defecate) and respiratory distress (pant, gasp, hiccup) with these terms being provided in a list. We also asked parents to rate the intensity of the tantrum described *relative* to that of the child's other tantrums over the past month on a 5-point scale from 1 (among the least intense in the past month) through 3 (about average intensity) to 5 (among the most intense in the past month). The definition of "intensity" was otherwise unspecified. In most cases, once the narrative had been received the parent was called back to verify details. We received 349 tantrum narratives, 331 of which were usable for this report. Parents were also asked to report the delay between when the tantrum occurred and when they wrote their description; the median reported delay was 2.75 hr (interquartile range was 0.5–14 hr).

The age × sex distribution of the children represented in the narrative subsample was almost identical to that in the original telephone survey. The age-related distributions of mean tantrum frequency and duration in children represented in the narratives were also quite similar to those in the survey [Potegal et al., in preparation]. By these criteria, the children whose tantrums were reported in the narratives appear representative of those in the preceding telephone survey. By the time all the narratives had been received, three children were 60–63 months old. These few 5-year-olds were grouped with the 4-year-olds in all analyses. Review of job, education, and racial self-identification information provided by parents suggested that respondents were largely middle class (e.g., mean educational level of both parents was college graduate) and, with the exception of two Asian families, white.

Defining Tantrums

Tantrums were defined as beginning with the first occurrence of a major tantrum element: arching back/stiffening limbs, dropping to the floor, shouting, screaming, crying, pushing/pulling, stamping, hitting, kicking, throwing something, or running away. The end of the tantrum was the point at which the last of these behaviors had stopped. Whining and attempts at affiliation during the tantrum were scored, but neither were used as tantrum boundary markers. Additional details of tantrum definition are provided in Potegal et al. [1996].

Scoring Variables

The next step in data processing was the conversion of each written narrative into a "tantrugram," a behavior × time matrix in which time was divided into consecutive 0.5-min intervals and behavior in each of the 13 different categories was scored as occurring or not occurring within each interval. The score for each behavior was the total number of intervals in which it appeared. The rules used in this coding of parental narratives are described in Potegal et al. [1996]. Reports of "shouting," "yelling," "hollering," and "loud verbal protest" were all coded as shouting while "screaming" or "shrieking" was coded as screaming. Physically angry behaviors consisted of stamping, pulling/pushing, hitting, kicking, and throwing something. This work was carried out by pairs of trained undergraduate raters, each of whom prepared a tantrugram for a given narrative. The two raters then resolved discrepancies by discussion or by refer-

ral to a supervisor. The supervisor subsequently reviewed and corrected the final tantrugram. Evaluations of scoring reliability, to be reported in detail in Potegal et al. [in preparation] generated kappas >0.7.

The child's pretantrum mood state was categorized as one of the following: 1) positive (when parents described the child as "happy," "cheerful," or "pleasant"); 2) neutral (for parental descriptors like "OK," "normal," or "calm"); 3) negative (for descriptors like "irritable," "whiny," "bored," "dependent," "nagging"; 4) "excited"; and 5) "tired." Children were also rated as "noncompliant" if the narrative indicated that they had refused the same parental command at least twice prior to the tantrum; they were rated as "compliant" otherwise. The cause of the tantrum was scored in two nonexclusive sets of categories. Since most reported tantrums are triggered by conflict with parents [Einon and Potegal, 1994], tantrums were first classed as started by 1) parental denial of the child's wish or 2) the child's refusal to obey a parental command to start or 3) stop a particular activity. The second category set indicated the substantive issue, i.e., conflicts with parents over 1) dressing, 2) eating, or 3) sleeping. The other categories in this set were 4) conflicts with sibs or peers and 5) frustration with inanimate objects, e.g., zippers that wouldn't zip or toys that wouldn't work. Tantrums which had multiple causes in a given set were excluded from the analysis of cause. Because not all tantrums fit into these categories, analyses of cause were carried out on a subset of the data.

After a review of all narratives, reported parent reactions to the child were coded into 10 categories: 1) give a verbal command or comment; 2) pick up, hold, and/or carry; 3) dress or undress; 4) give something to; 5) take something from; 6) restrain; 7) hit, slap, grab, or spank; 8) impose a time out; 9) leave (the scene of the tantrum); 10) cuddle, hug, or kiss. Like tantrum behaviors, these were scored as present or absent in consecutive half-minute intervals.

Defining PTA

Instances in which the child was reported as initiating or soliciting physical contact within a few minutes after the tantrum were scored as physical PTA. Also included were cases in which the child responded actively to a parent-initiated overture, e.g., an invitation to lap sit. Passive acceptance of hugs and kisses were not counted. Instances in which the child initiated a verbal exchange with the parent (including, but not limited to, apologies) were scored as verbal PTA. A child could be scored as demonstrating neither, one, or both forms of PTA. Ambiguous cases (e.g., the child resumes hand holding while walking in the mall) and cases in which the child and parent were reported to reconcile simultaneously were not counted. Self-consolation (SC), i.e., sucking on fingers or pacifier and object use (asking for or holding a blanket or soft toy) after the tantrum were also noted.

RESULTS

When PTA (physical or verbal) was simply scored as absent or present, 29% of all tantrums were followed by PTA. Table I shows that there was little difference between boys and girls in PTA incidence, but that there was an increase with age. Accordingly, the best-fitting log linear model showed a significant interaction between PTA and year of age, but not with sex (see Table II). Effect sizes (Table II), falling between

small and medium in Cohen's [1992] system, were similar in boys and girls as might be expected from the lack of sex differences.

Multiple regression and log linear analyses indicated no effect of the chronic characteristics of estimated mean tantrum frequency, duration, or their product on the probability of PTA. There was also no correlation with the time of day. Log linear analyses revealed no association with PTA of the tantrum precursor variables of tantrum cause or child's mood or state of compliance.

With regard to intratantrum variables, a canonical correlation analysis in which physical and verbal PTA were treated as correlated dependent variables and the total durations of the 13 tantrum behaviors were treated as the independent variables showed a significant first root [canonical R = 0.32, χ^2 (26) = 42.3, $P < 0.25$]. This canonical correlation, which allowed physical and verbal PTA to be treated separately without assigning arbitrary weights to them, accounted for 6.9% of the variance across all subjects. The major canonical weight for the first root of the independent variables was provided by screaming (weight = 0.8); this was at least twice as large as the weight of the next largest contributor. Within this analysis, the correlations between screaming and physical and verbal PTA were 0.21 and 0.22, respectively; all but one other correlation was <0.1. These results were supported by a stepwise regression of PTA presence or absence on tantrum behavior in which screaming was the only behavior to generate a significant beta value (Table II). Although these parametric analyses are useful in identifying screaming as a behavior of interest, their appropriateness can be challenged because the distributions of the behavior durations are more exponential than normal. In an alternative approach, a stepwise discriminant analysis ($F(1,329) = 15.9, P < 0.001$, Wilks' lambda = 0.95] indicated that tantrums with 6 min or more of screaming were more likely to be followed by PTA (74% of 19 tantrums), while tantrums with fewer than 6 min of screaming were less likely to be followed by PTA (24% of 312 tantrums). This was confirmed by a chi-square test (Table II). There was a medium effect size for boys considered separately which was a third greater than that for girls. There was no significant correlation between tantrum duration per se and PTA probability. The foregoing canonical and regression analyses revealed no effect of individual angry behaviors on PTA. The possibility that PTA may be affected by overall physical anger rather than any particular angry behavior was evaluated by correlating PTA with the sum of angry behaviors; this correlation, r = 0.1, was not significant. A chi-square test similarly failed to demonstrate any association between the presence or absence of any form of physical anger and PTA [$\chi^2(1) = 0.8$].

TABLE I. Percentages of Boys and Girls of Different Ages Showing PTA

	Age (months)			
	18-23	24-35	36-47	48-60
Boys				
Percent[a]	27	28	20	49
Number[b]	55	46	41	35
Girls				
Percent[a]	15	37	23	36
Number[b]	41	46	39	28

[a]Percentage of children of a given age and sex showing PTA.
[b]Number of children of a given age and sex.

TABLE II. Variables Affecting PTA*

Variables	Test	Results (all children)	Effect size Boys	Effect size Girls
Age × sex	Log linear	$\chi^2(8) = 6.7$, $P = 5.6$ partial and marginal associations with PTA/age interaction excluded: $\chi^2(3) \geq 10.7$, $P < .02$		
Age	Chi-square	$\chi^2(3) = 11.2$, $P < .02$	0.22	0.21
Scream	Stepwise regression	$R = 0.27$, $P < .05$ $\beta = 0.2 \pm 0.5$, $P < .003$		
	Chi-square	$\chi^2(1) = 19.9$, $P < .0001$	0.29	0.21
Physiological stress	Chi-square	$\chi^2(1) = 5.7$, $P < .025$	0.17	0.09
Separation	Chi-square	$\chi^2(1) = 6.8$, $P < .01$	0.13	0.18
Age, scream, physiological stress, separation	Canonical correlation	$R = 0.31$, $P < .0001$	0.16	0.10
	Log linear	$\chi^2(77) = 71.3$, $P = .66$ partial associations with PTA/variable interaction excluded:		
		Screaming: $\chi^2(2) = 10.9$, $P < .005$		
		Age: $\chi^2(3) = 9.5$, $P < .03$		
		Separation: $\chi^2(1) = 5.6$, $P < .02$		
		Physiological stress: $\chi^2(1) = 2.5$, NS		

*Effect sizes were calculated from the formulae in Cohen [1992] for chi-square values and regression coefficients.

With regard to visible facial autonomic activity, we found that parasympathetic signs, sialorrhea or rhinorrhea, showed a trend for association with PTA [$\chi^2(1) = 2.8$, $P = .09$] while sympathetic signs, flushing or sweating, showed little trend [$\chi^2(1) = 1.8$]. When one point was assigned for each facial and nonfacial autonomic sign and for each sign of respiratory distress, there was a significant correlation between autonomic activity and respiratory distress ($r = 0.4$, $t = 7.9$, $P < .0001$). We therefore created a dichotomous variable of physiological stress based on the presence or absence of any autonomic or respiratory sign. There was a significant association between this more general measure of physiological stress and PTA (Table II). The effect size for boys was almost twice that for girls (Table II).

As expected, the most frequently reported tantrum intensity category was 3, i.e., average intensity (n = 182). There were relatively fewer tantrums of lower relative intensity in our sample. After collapsing intensities 1 and 2 into a single low-intensity category (n = 54) and 4 and 5 in a high-intensity category (n = 93), the percent of PTA in the three progressively higher intensity categories was 17%, 27%, and 37%, respectively [$\chi^2(2) = 6.8$, $P < .04$].

Canonical correlation and stepwise multiple regression of PTA on parent behaviors revealed no significant main effects ($Rs \leq 0.24$). However, the stepwise regression generated significant beta values for leaving and for imposing a time out ($\beta s = 0.12 \pm .06$, $P \leq .04$). Leaving and time out are similar in that they both involve parent-initiated separation from the child. These two variables were, therefore, combined into a single post hoc dichotomous variable, separation (i.e., if the parent left or the child

was given a time out, separation = 1, otherwise separation = 0). A chi-square test confirmed a significant association between separation and PTA (Table II). In this case, the effect size for girls was almost a third greater than that for boys (Table II). There was also a significant association between screaming and separation [$\chi^2(2) = 8.8$, $P < .02$]. In 95% of the 41 tantrums in which the child screamed and the parents imposed a separation, the screaming preceded the separation (binomial test, t = 7.0, $P < .0001$). Separation appears to be a parental response to screaming rather than a stimulus for it.

To estimate the total variance accounted for by the four variables of age, screaming, physiological stress, and separation, we first used a canonical correlation as above, treating all variables as continuous. Over the entire sample, 6.6% of the variance was accounted for. For boys separately this figure was 9.2% for girls it was 5.5%. Accordingly, the overall effect size for boys was in the medium range and a third greater than that for girls (Table II). To fit a log linear model, age was partitioned by year as above, physiological stress and separation were treated as dichotomous, and screaming was partitioned into three duration categories (i.e., scream = 0 min, 6 min > scream > 0, scream ≥ 6 min). The best fitting log linear model of these four variables showed significant two-way interactions of PTA with screaming, separation, and age, but not with physiological stress (Table II). There were no three- or four-way interactions. Physiological stress and separation both had significant interactions with screaming, i.e., as screaming increases so do these variables. For example, 31% of nonscreamers were reported with at least one sign of physiological stress; 81% of the most persistent screamers were so reported.

SC was reported following 10% of all tantrums; the children sucked on fingers or pacifier (n = 15), held a blanket, stuffed animal, or other object (n = 14), or both (n = 7). Among boys, SC was most frequent among 1-year-olds (12%) and dropped off monotonically with age. There was no clear pattern for girls, with roughly 13% of tantrums at each age being followed by SC. There was no significant association between SC and PTA [$\chi^2(1) = 0.49$].

DISCUSSION

PTA probability appears to increase with a developmental status variable, age (within the range of 18–63 months); a simple intratantrum variable, prolonged screaming; and two composite intratantrum variables, physiological stress and separation between child and parent during the tantrum. One possible explanation for the increase in PTA with age is that the distress which characterizes the end of a tantrum persists longer as children develop so that they become more likely to seek comfort. Einon and Potegal [1994, Table 7.2] have replicated Goodenough's [1931] findings of increased incidence of reported tantrum "aftereffects" with age; the age-related increase in the percentage of aftereffects in those studies roughly parallels the increases in PTA in the present study. The social emotions of shame, guilt, and embarrassment are thought to emerge in the period between 12–36 months of age [Ferguson and Stegge, 1995; Lewis, 1995; Stipek, 1995] and these may become motivators for PTA. In addition, increasing cognitive ability and empathic capacity, which raises children's concern for their parents' feelings, and increasing socialization, which prescribes verbal apologies for social transgressions, may also contribute to the age effect.

That screaming but not shouting is associated with PTA confirms the distinction we

made between these two forms of loud vocalization. High-pitched vocalizations are associated with fear and appeasement in many animal species [Morton, 1977]. In nonhuman primates, screaming is common in agonistic encounters where it is often associated with defensive behaviors in which the screamer, usually a subordinate animal in its group, is protesting against threatened or ongoing attack. In their review of the empirical evidence, Gouzoules et al. [1995] conclude that screaming functions in the recruitment of aid from other group members and that, in adults, the several types of scream convey information about the animal's immediate social situation (e.g., the relative rank of its opponent) rather than its internal state. These authors note that screams are less well differentiated in juveniles, leaving open the possibility that in younger animals screams may be more reflective of their internal state.

A composite measure of visible and audible markers of physiological stress, i.e., autonomic activity and respiratory distress, was also a predictor of PTA. Physiological stress was significantly associated with screaming. Literature searches have revealed no information on the physiology of tantrums but parents' reports of children who scream so long and so loudly that their eyes become bloodshot and capillaries in their cheeks burst are complemented by basic neurophysiological research associating defensive vocalization with increases in blood pressure and heart rate [Bandler et al., 1991]. Screaming and associated tantrum behaviors may activate some of the same processes found in exercise such as a reduction in blood oxygenation in the first few minutes which is subsequently offset by effects associated with compensatory hyperventilation [Rausch et al., 1991]. Hyperventilation and associated physiological effects have been linked to the bronchospasm which occurs in a large fraction of asthmatic children and a smaller proportion of healthy children following several minutes of exercise. A number of features of exercise-induced bronchospasm parallel the physiological stress in tantrums including a higher prevalence in boys, an increase with the intensity of the exercise, and a peak level which is reached after 6 min of exercise [Shepard, 1977]. Bronchospasm may be a constituent of what we have labeled respiratory distress. Screaming can also acutely produce changes in the vocal folds including small hermorrhages; with prolonged screaming the tissue can become hyperemic and edematous [Aronson, 1990; Case, 1991]. Chronic screaming is associated with lesions at the junction of the anterior and middle third of the vocal folds known clinically as "screamer's nodules" [Lancer et al., 1988] and are, in fact, found at a higher rate in tantrum-prone children [Green, 1989]. When physiological stress was included with screaming in regression and log linear analyses, it appeared to make no independent contribution to PTA. However, it possible that the processes noted above may mediate the effects of screaming on PTA by increasing the physical discomfort the children experience and thereby exacerbate their need for consolation.

The log linear analysis indicated that the post hoc variable of separation, composed of the parent-initiated behaviors of leaving or imposing a time out, directly and independently increases PTA probability. Note that there was no association between the child's running away during the tantrum and PTA. This suggests that it is not the physical distance between child and parent, but the forced separation, that affects PTA. Separation may be an age-appropriate physical expression of the metaphorical "social distance" which the introduction to this issue suggests is a primary trigger for appeasement and reconciliation. Separation also increased significantly with prolonged screaming, suggesting that prolonged screaming is sufficiently aversive to parents that they

separate themselves from the child. Thus, separation may also mediate the effects of screaming on PTA.

Screaming increases PTA and it may do so through several routes. In contrast, there was no evidence that PTA was associated with the presence or degree of physically expressed anger. PTA may be associated with distress to the extent that prolonged screaming reflects distress. PTA is somewhat more correlated with parasympathetic than sympathetic signs, although neither correlation is significant. The parasympathetic signs of sialorrhea and rhinorrhea typically co-occur with lacrimation during crying and this is also suggestive of a connection between PTA and distress. The contribution to PTA of facial parasympathetic activation and associated processes should be investigated further.

The size of the effects of screaming and physiological stress on PTA was in the small to medium range and was greater in boys than in girls. The converse was true for separation, suggesting that PTA may be mediated somewhat differently in boys than in girls. Examination of the contingency tables indicates that the differences do not appear to be due to differences in the relative distributions of screaming duration nor to the mediation of screaming effects, i.e., the proportions of male screamers who showed physiological stress or experienced separation were not greater than the corresponding proportions of female screamers. One possibility is that parental expectations that girls will make greater efforts to maintain relationships may lead to their PTA being less noticed and, therefore, underreported while PTA in boys is more salient.

PTA appears related to post fight reconciliation among nonhuman primates in several ways. Screaming is associated with PTA in young children and defensive behavior, including aid recruitment, in nonhuman primates. It would be of interest to look at the predictive value of screaming for reconciliation in the appropriate primate species. If we consider the possibility that physiological stress may be a mediator of the screaming effect on PTA, rather than merely by its byproduct, there may be a parallel between physiological stress and PTA in children and the effects of arousal [Aureli, 1997] on reconciliation in monkeys. The incidence of PTA was 29%; similarly, reconciliation in most species of nonhuman primates occurs following less than 50% of agonistic encounters. Reconciliation is most likely towards group members contributing the most to an animal's inclusive fitness, e.g., kin or coalition partners [de Waal and Aureli, 1996]. Tantrums typically involve a child's conflicts with its parents, predicting a relatively high rate of PTA. A reconciliation rate of 29% is about that reported for adult chimpanzees but less than is reported for bonobos [de Waal, 1993]. In some primate species it is more often the initiator of aggression than the recipient who reconciles [de Waal, 1993]. PTA fits this pattern in that it is the child who hits and kicks. However, among nonhuman primates, the aggressor is almost always a socially dominant animal. In the case of tantrums, the child is the initiator but is also subordinate; it is perfectly clear to both child and parent who has the power and controls the resources.

Our data suggest that SC is not correlated with PTA. Our frequency of SC, 10% overall, is at the lower end of the distribution of published frequencies. The recording of SC was not mentioned in our instructions to parents and may have been underreported. Furthermore, our reports reflect only a single observation in time whereas studies focusing on SC have used longer observation periods. The majority of studies suggest that object use for SC is greater among psychologically well-adjusted children than poorly adjusted or disturbed children [see review by Litt, 1986; c.f., Lookabaugh and

Fu, 1991]. In this context, we note that ours is a sample of tantruming children only; depending on age, up to 50% of the population has been excluded from our sampling. Tantrummers at the extremes of the frequency and duration distributions probably represent poor adjustment and our rates of SC may be reduced accordingly.

There are several caveats with regard to our results. First, in the interest of examining a broad variety of factors contributing to PTA variance, we have carried out multiple statistical tests, thus increasing the chance of type 1 error. These analyses must be regarded as exploratory rather than confirmatory and the variables identified should be regarded as potential rather than proven associations with PTA. Second, the identified variables account for only a small portion of PTA variance at best. Other factors must be at work. Third, the information about PTA and all other variables has been generated by parents, raising the problem of source variance. This work should be replicated and extended with direct observation of tantrums.

The finding that PTA increases with tantrum intensity is, perhaps, the most obvious result for which concern about source variance is warranted since it is entirely possible that parents judge a tantrum to have been of greater intensity when it is followed by PTA. While keeping this concern in mind, we find it of interest to conjecture about the effects of intensity. In her book on holding therapy for children, Welch [1988] presents a technique for forestalling or terminating tantrums in which the child is tightly held, direct eye contact is made, and the child is talked to quietly. The immediate effect of holding is to exacerbate the child's anger, provoking loud protests and violent struggling. However, according to Welch [1988], continued holding eventually leads through several steps to a "resolution" phase which is signaled by a relaxation of tension, smiling, and active cuddling on the part of the child. This change is reportedly so sudden and dramatic that Welch labels it "catharsis"; reciprocal intense pleasant feelings are also reported to be experienced by the holder. It thus appears as if intensifying the initial anger and negative emotions of a tantrum by holding brings about a reconciliation phase which is also intensified well beyond that which occurs spontaneously. If reliable, these results suggest an opponent process-type coupling [Craig and Siegel, 1979; Mauro, 1988] between earlier negative emotional tantrum processes and later positive post tantrum processes which depend on intensity. Reconciliation probability increases with fight intensity in bonobos, but not in chimpanzees [de Waal, 1993]; Aureli [1997] finds that post conflict scratching, a predictor of reconciliation in several macaque species, is unaffected by fight intensity. Dunn and Herrera [1997] found that emotional upset reduced the likelihood of argument resolution between older children. The role of intensity-dependent opponent processes in post conflict affiliation and reconciliation may be restricted to tantrums and cognate phenomena.

Part of the significance of reconciliation is that it appears to occur in different domains of human social life. As pointed out by Keltner et al. [1997], reconciliation among humans is sometimes reified in formal rituals, from the phrase "I'm sorry" used by English speakers to the face-to-face hugging and chanting of Yanomamo fighters after a duel [Chagnon, 1967]. The emotional bases of these cultural prescriptions may be first experienced by children in the aftermath of their tantrums.

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