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Crying and Infant Abuse in Rhesus Monkeys

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This study investigated the relation between crying and infant abuse in group-living rhesus monkeys (*Macaca mulatta*). The subjects were 10 abusive mothers with their infants and 10 control mother–infant pairs. Abused infants cried more frequently than controls in the first 12 weeks of life, even when cries immediately following abuse were excluded from the analysis. The coos of 5 abused infants differed from those of 5 controls in several acoustic parameters, whereas their screams and geckers were acoustically similar, when recorded in the same context. Abusive mothers were less likely than control mothers to respond positively to the cries of their infants. Although infant cries may increase the probability of abuse being repeated, infant crying per se does not appear to be a major determinant of abuse.

INTRODUCTION

Infant maltreatment is a phenomenon common to both human and nonhuman primates (Maestripieri & Carroll, 1998a; Reite & Caine, 1983; Seay, Alexander, & Harlow, 1964; Troisi, D'Amato, Fuccillo, & Scucchi, 1982). Recent studies of infant abuse in three large populations of Old World monkeys in captivity indicated that 2–10% of all infants born in the population were at risk of abuse from their biological mothers (Maestripieri & Carroll, 1998b; Maestripieri, Wallen, & Carroll, 1997a, 1997b), which is similar to the child maltreatment rate recently reported for the United States (USDHHS, 1997). Further similarities in the determinants of infant abuse as well as in some of its developmental consequences in monkeys and humans suggest that nonhuman primates could be a valid animal model for research on child maltreatment (Maestripieri & Carroll, 1998a).

Research on child maltreatment has identified a variety of factors that may potentially contribute to the occurrence of this phenomenon. Early efforts to understand child maltreatment emphasized the role of the parent's personality, the child's behavior, or the social environment as possible determinants (see Rogosch, Cicchetti, Shields, & Toth, 1995, for a review). More recently, integrative models have been proposed in which individual characteristics, social-interactional processes, and ecological factors contribute to child maltreatment through interactions at various levels of analysis (e.g., Belsky, 1993). However, because empirical studies are rarely comprehensive enough to incorporate multiple causal factors into a single investigation, the contribution of the parent, the child, or the environment to child maltreatment often continues to be investigated independently from the other components.

Similar to child abuse in humans, infant abuse in monkeys is likely to be determined by multiple factors. Recent studies have indicated that close genetic relatedness to other abusive mothers, abuse of previous offspring, high maternal anxiety, controlling parenting styles, and a stressful environment can be considered risk factors for infant abuse (Carroll & Maestripieri, 1998; Maestripieri & Carroll, 1998a, 1998c). The potential contribution of infant characteristics to triggering abuse, however, has not been systematically investigated (Maestripieri & Carroll, in press). The only difference between the behaviors of abused and nonabused infants that has been reported is that the former evidence a delay in acquiring independence from their mothers (Maestripieri, 1998; Maestripieri & Carroll, 1998c; Seay et al., 1964). This difference, however, is likely to reflect a consequence rather than a determinant of abuse.

In humans, abused children are often reported to have a difficult temperament or disruptive behavior (Greenwald, Bank, Reid, & Knutson, 1997; Trickett & Kuczynski, 1986), although abusive parents may be negatively biased in the perception of their children's behavior (Reid, Kavanagh, & Baldwin, 1987). In humans there is also a relatively high incidence of abuse among premature infants or children with physical and mental handicaps, although there are some inconsistencies in the literature and in some cases the handicaps could be a consequence of the abuse itself (Martin, Beezley, Conway, & Kempe, 1974; Sandrund, Gaines, & Green, 1974). Interestingly, it has been reported that the cries of "atypical" infants (e.g., premature, with Down syndrome, or with brain damage) are higher-pitched than normal, and that high-pitch and long cries are generally less effective in eliciting caregiving responses from listeners (Boukydis, 1985; Frodi et al., 1978; Frodi & Senchak, 1990; Furlow, 1997;

Golub & Corwin, 1982; Zeskind & Lester, 1981; but see Zeskind, 1980; Zeskind & Marshall, 1988). While these findings may suggest that the cries of atypical infants increase the probability of maltreatment (Frodi, 1981, 1985), it is also possible that parents who maltreat perceive crying as especially aversive independently of its acoustic characteristics. In fact, maltreating parents have been reported to experience a greater increase in heart rate and more aversion to infant cries than nonmaltreating parents (Frodi & Lamb, 1980; see also Murray, 1985).

Crying is the predominant vocal expression of nonhuman primate infants (Maestripieri & Call, 1996), and the many similarities between primate and human crying suggest that both the neurological mechanisms controlling infant cries and their function have had a conservative evolutionary history across the entire Primate order (Newman, 1985; Todt, 1988). Therefore, understanding the potential contribution of crying to the occurrence of infant abuse in nonhuman primates could have implications for understanding the relation between crying and child abuse in humans as well.

In this study we investigated the acoustic characteristics of crying in rhesus monkey infants that are physically abused by their mothers. This study was part of a larger research project investigating behavioral differences between abusive and nonabusive mother–infant dyads (Maestripieri, 1998). Rhesus infants cry for a variety of reasons in addition to abuse, including maternal rejection, kidnapping, or harassment by another adult. To assess whether crying is potentially a contributing factor for abuse, we investigated whether abused infants cried more frequently than nonabused infants, whether their cries were acoustically different from the cries of nonabused infants, and whether abusive and nonabusive mothers differed in their behavioral responsiveness to infant cries.

METHOD

Subjects and procedure. This study was conducted from March to August, 1996, at the Field Station of the Yerkes Regional Primate Research Center in Lawrenceville, Georgia. At the beginning of the birth season, in March, 1996, one of us (D. M.) began ad libitum observations of four rhesus macaque groups housed in adjacent outdoor compounds (35×35 m) with attached indoor quarters. Each group consisted of 2–5 adult males and 25–30 adult females with their subadult and juvenile offspring. Food and water were freely available to all animals. The criterion used to identify abusive mothers was the occurrence of one of the following behavior patterns: infant dragging, crushing, throwing, or sitting/stepping on (see below for definitions). These patterns are clearly distinguishable from other behaviors in the maternal and aggressive repertoire, such as those observed during mother–infant weaning conflicts.

We identified 10 abusive mother–infant pairs in three groups. In 7 mother–infant pairs, we observed the first episode of infant abuse in the first week of infant life. In the other 3 mother–infant pairs, we observed the first infant abuse episode in weeks 5, 7, and 9, respectively. We immediately began focal observations of the mother and her infant and continued them until the 12th week of infant life. We observed each mother–infant pair in four weekly 30-min observation sessions randomly distributed between 0800 and 1900 hours. We made observations from a platform that provided unrestricted view of the entire compound and collected data with a portable computer. Ten rhesus mothers that were never observed to display infant abuse during the first 12 weeks of infant life served as controls. We obtained data on controls from a previous study of normative parenting and infant development in rhesus macaques. This study comprised 11 mothers but one of them displayed one instance of infant abuse and therefore was not used as a control. Control mothers were similar to abusive mothers in age, reproductive experience, and dominance rank, and lived in the same social groups as the abusive mothers (see Maestripieri, 1998). We observed abusive mothers and controls using similar procedures during the same period of infant life.

Data collection. The same individual made all behavioral observations. Prior to the onset of data collection, he and another observer recorded maternal and infant behavior at the same time in several consecutive observation sessions. We considered inter-observer reliability to have been achieved when agreement in recording behavior exceeded 90% and Cohen's κ (Cohen, 1960) exceeded .8. We included the following behavior patterns in the infant abuse category:

1. Dragging: the mother drags her infant by its tail or leg while walking or running.
2. Crushing: the mother pushes her infant against the ground with both hands.
3. Throwing: the mother throws her infant at a short distance with one hand while standing or walking.
4. Stepping or sitting on: the mother steps on her infant with one foot or both feet, or sits on her infant.

Previous observations had shown that abuse events

do not last more than a few seconds. Therefore, they were only recorded in terms of their frequency. We recorded infant abuse as two separate events if there was a transition in the pattern of behavior (e.g., from dragging to throwing) or if there was a pause of at least 10 s during the behavior.

To investigate possible differences in the frequency of infant crying and in maternal responses to the cries of abused and nonabused infants, we recorded the number and context of occurrence of all infant distress calls. We classified infant distress calls as "abuse cries" if they were preceded by maternal abuse within a 30-s interval, and "nonabuse cries" if they were preceded within the same time interval by other events, such as interruption of mother–infant contact, maternal rejection (i.e., the mother forcibly removing her infant from her breast or preventing the infant from making contact), or harassment or kidnapping (i.e., another individual roughly grabbing and pulling the infant or preventing the infant from returning to its mother). All the cries of control infants were, by definition, nonabuse cries. We classified maternal responses to infant cries as positive, negative, abusive, or indifferent. Responses were considered positive if the first maternal behavior within a 30-s interval after a cry was making contact with the infant, cradling or grooming the infant; negative if the first maternal behavior was breaking contact with the infant or rejecting the infant; and abusive if the first maternal behavior was abuse (e.g., crushing, throwing). If no maternal behavior occurred within a 30-s interval after a cry, the maternal response was considered indifferent. We excluded infant cries during kidnapping from the analysis of maternal responsiveness because in such situations mothers are usually prevented from interacting with their infants by the kidnapper (Maestripieri, 1993).

To investigate possible differences in the acoustic structure of cries in abused and control infants, one of us (T. J.) recorded the distress calls of 5 abused infants and 5 controls using a Sony TCM-5000 tape recorder and a Sennheiser directional microphone (model MKH 816) equipped with foam windscreen. We used only the infants living in the same social group for this part of the study to minimize variability in the acoustic conditions in which cries were recorded. We recorded calls in abuse and nonabuse contexts (e.g., maternal rejection, kidnapping, or harassment; we made no distinction among nonabuse cries in relation to their context, although rejection and kidnapping calls were by far the most common). We analyzed infant distress calls using the Signal/RTS (K. Beeman, Engineering Design) and Signalyze (E. Keller, Signal, Inc.) software packages and, based on their acoustic structure, we differentiated them as screams, coos, or geckers using the following definitions (see Gouzoules, Gouzoules, & Marler, 1984; Newman, 1985).

Screams: tonal (with energy distributed in a narrow frequency band) or atonal calls with broad bandwidth (peak frequency minus minimum frequency) and long duration, usually constant from start to end.

Coos: predominantly tonal calls of narrow bandwidth, usually with several harmonics (frequency bands) but given at a very low rate.

Geckers: tonal or atonal calls with broad bandwidth and distinct pulses of energy given at a high rate, usually very uniform, but with occasional pulse twinning (duplication).

We analyzed the following number of distress calls: screams, $n = 24$; geckers, $n = 44$; coos, $n = 34$. Half of these calls were obtained from subjects, and half from controls.

Data analysis. We summed the frequencies and durations of behaviors recorded in the four weekly sessions to obtain weekly scores and then analyzed them with repeated measures ANOVA followed by Bonferroni-Dunn post-hoc tests. We also used regression and Wilcoxon matched-pair tests to analyze the frequency of crying and the maternal responses to infant cries. Whenever the data failed to meet the assumptions necessary for the use of parametric tests, they were transformed by using square-root transformations in the case of frequencies and durations, and arcsine transformations for percentages.

The structural analysis of infant screams, coos, and geckers focused on the following acoustic variables, some of which are quantitative and some categorical (see Gouzoules & Gouzoules, 1989, for a more detailed description).

Screams: call rate, call number (number of calls in a vocal bout), call duration (ms), peak frequency (kHz), peak frequency of main energy (i.e., peak frequency of the region of greater energy concentration in the call), peak frequency position (in the first third, middle, or last third of the call), and call structure (whether the call was uniform or composed of both tonal and atonal components).

Coos: call duration, onset, and termination frequency (i.e., the frequency of the onset and termination of the call), number of harmonics (frequency bands), peak frequency of basic harmonic and of highest harmonic, number of inflections, peak frequency position, and harmonic with the most energy.

Geckers: call rate, call number, call duration, peak frequency, twinning (whether or not the call showed two pulses very close together), peak frequency position, and call structure.

We analyzed a random sample of 10 calls of each type for each infant and compared them between controls and abused infants. We analyzed quantitative variables such as call duration and peak frequency with a one-way ANOVA. For categorical variables, we used a χ^2 test. In all analyses, $ps \leq .05$ were considered statistically significant.

RESULTS

Frequency of crying. Previous analyses presented elsewhere showed that the frequency of abuse decreased with infant age (Maestripieri, 1998). The average frequency of abuse cries was negatively correlated with infant age (in weeks) as well, $r(11) = -.84$, $F(1, 10) = 24.58$, $p < .001$. Figure 1 depicts the total number of cries of abused and control infants, and the number of nonabuse cries of abused infants during the first 12 weeks of life. When the nonabuse cries of abused and control infants were compared, repeated measures ANOVA revealed both a main effect of infant age (in weeks) on the frequency of cries, $F(11, 165) = 1.97$, $p < .05$, and a significant difference in the frequency of cries between abused and control infants, $F(1, 15) = 4.58$, $p < .05$. The average frequency of nonabuse cries was positively correlated with infant age (in weeks) for all infants, $r(11) = .65$, $F(1, 10) = 7.2$, $p < .05$, whereas abused infants cried significantly more than did controls (post-hoc test, $p < .05$). More specifically, abused infants cried significantly more than did controls in the first month, $F(1, 15) = 6.65$, $p < .05$; post-hoc test: $p < .05$, and in the second month, $F(1, 16) = 6.09$, $p < .05$; post-hoc test: $p < .05$, but not in the third month, $F(1, 16) = .84$, $p > .05$.

Maternal responsiveness to infant cries. When the percentages of positive responses to the nonabuse cries of abused and control infants were compared, repeated measures ANOVA revealed both a main effect of infant age, $F(2, 30) = 40.57$, $p < .001$ (Figure 2), and a difference between abusive and control mothers, $F(1, 15) = 7.46$, $p = .01$. The percentage of positive responses to nonabuse cries of all infants decreased as infants grew older, $r(11) = .92$, $F(1, 10) = 52.79$, $p < .001$, and abusive mothers were less likely to respond positively than control mothers, post-hoc test: $p < .05$.

Wilcoxon matched-pair tests revealed no significant differences in the relative percentage of positive (abuse, $M \pm SE = 12.00 \pm 3.29$; nonabuse $= 16.22 \pm 4.93$), negative (abuse $= 31.45 \pm 8.14$; nonabuse $= 34.03 \pm 4.08$), and indifferent responses (abuse $= 33.05 \pm 5.54$; nonabuse $= 47.27 \pm 3.38$) of abusive

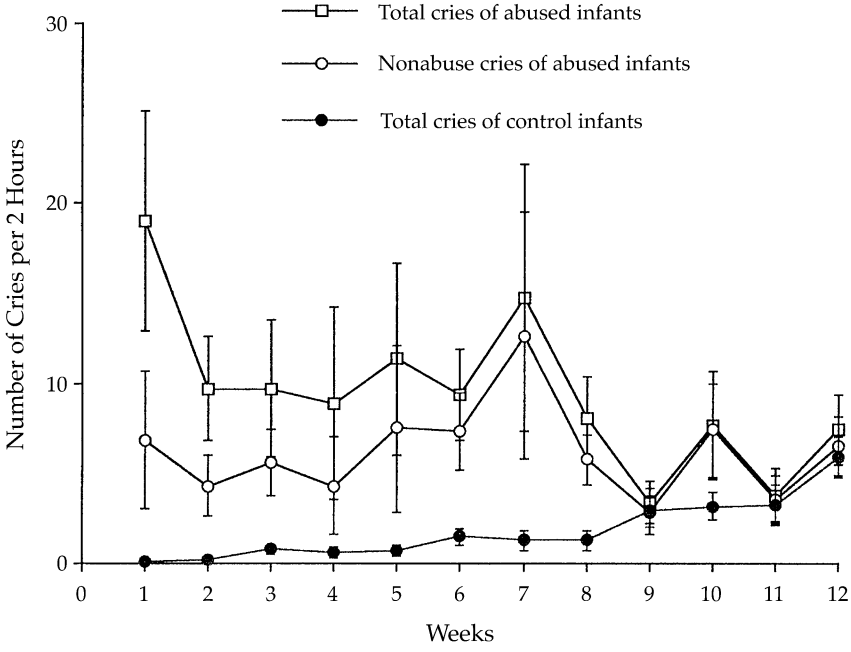

Figure 1 Mean (+*SE*) number of cries of abused and control infants per individual per 2 h in the first 12 weeks of infant life. The figure depicts the total number of cries for abused and control infants as well as the number of nonabuse cries for abused infants. For abused infants: weeks 1–4, $n = 7$, weeks 5–6, $n = 8$; weeks 7–8, $n = 9$; weeks 9–12, $n = 10$.

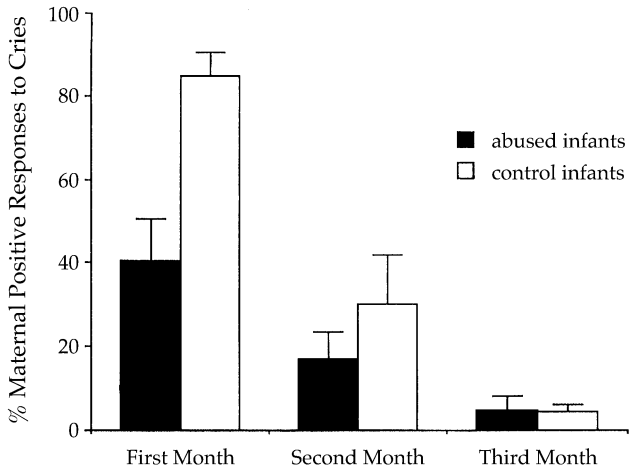

Figure 2 Mean (+*SE*) percentage of maternal positive responses to the cries of abused and control infants in the first 3 months of infant life. Differences between abused and control infants are statistically significant in the first and second months, but not in the third month (see Results).

mothers to the cries of their infants in abuse and nonabuse contexts. The percentage of abusive responses to abuse cries, however, was significantly higher than the percentage of abusive responses to nonabuse cries (abuse = 23.50 ± 5.57; nonabuse = 2.48 ± .74; $z = -2.52$, $p < .05$). Therefore, abuse was more likely to follow a previous instance of abuse and an abuse cry than to follow infant crying per se. In fact, only 8.54% of all 234 abuse events were preceded by nonabuse cries, whereas 33.76% of abuse events were preceded by abuse cries.

Acoustic structure of infant cries. Among abused and control infants, the most frequent calls were geckers (43.3%), followed by coos (41.9%), and screams (14.8%). During abuse (for abuse group only), however, the most frequent calls were screams. The comparison of the abuse screams of abused infants and the nonabuse screams of control infants revealed significant differences in call duration, call rate, and number of calls per bout, whereas differences in other measures were not significant (Table 1). The abuse screams of abused infants were shorter than the screams of controls, $F(1, 17) = 16.57$, $p < .01$; the call rate was higher for abused infants than for controls, $F(1, 17) = 7.79$, $p < .05$; and the number of calls per bout was lower for abused infants than for controls, $F(1, 17) = 8.92$, $p < .01$. Furthermore, the screams of abused infants were more likely than those of controls to be uniform (i.e., not composed of both tonal and atonal components), $\chi^2(1, N = 18) = 8.92$, $p < .01$. Similar statistically significant differences were found between the abuse and nonabuse screams of abused infants, however, suggesting that the call difference between abused infants and controls resulted from the context of occurrence rather than the infants' vocal characteristics. In fact, the comparison of nonabuse screams of abused and control infants yielded nonsignificant results, although the abuse calls tended to be shorter than the control calls (Table 1).

Table 1 Acoustic Structure of Cries in Abused and Control Infants

	Abused Infants		Control Infants
	Abuse	Nonabuse	Nonabuse
Screams			
Duration (s)	.37 ± .06	1.75 ± .21	2.33 ± .48
Call rate (unit/s)	4.06 ± .67	1.92 ± .18	2.11 ± .21
No. of calls per bout	1.22 ± .15	3.33 ± .42	4.89 ± 1.09
Coos			
Ending freq. (Hz)	—	1,266 ± 45	1,601 ± 129
Peak freq. BH (Hz)	—	1,424 ± 56	1,773 ± 135
Peak freq. HH (Hz)	—	4,273 ± 288	5,411 ± 261

Note: BH = basic harmonic; HH = highest harmonic.

Because coos occurred rarely in the context of abuse, only nonabuse coos of abused and control infants were compared. The termination frequency of the call was lower for abused infants than for control infants, $F(1, 69) = 6.00$, $p < .01$ (Figure 3). Furthermore, the peak frequency of the basic harmonic and the highest harmonic were lower in the coos of abused infants than in those of controls: basic harmonic, $F(1, 69) = 5.73$, $p < .05$, and highest harmonic, $F(1, 69) = 8.58$, $p < .01$. In the coos of abused infants, the basic harmonic had the most energy, whereas in the coos of control infants the most energy was in the second harmonic, $\chi^2(1, N = 64) = 13.30$, $p < .01$. Furthermore, unlike controls, in the coos of abused infants the peak frequency position was at the onset of the call, $\chi^2(1, N = 64) = 9.56$, $p < .01$.

The geckers of abused and control infants did not differ in any of the acoustic parameters measured, irrespective of the context in which they were recorded.

DISCUSSION

This study revealed several differences between abused and control infants in their frequency of crying, the acoustic structure of some of their cries, and the responsiveness of abusive and control mothers to infant cries. The frequency of abuse events and of infant cries immediately following abuse decreased over the first 12 weeks of infant life (see also Seay et

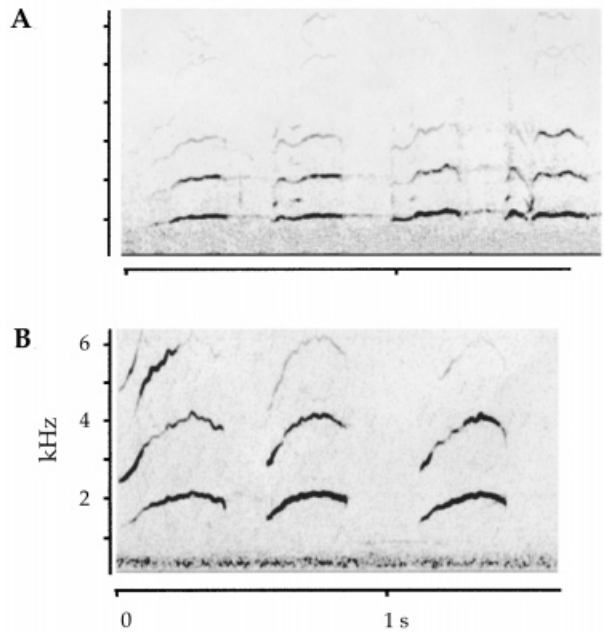

Figure 3 Spectrogram of infant coo calls elicited by events other than abuse. A: abused infant, B: control infant. Frequency is represented on the vertical axis and time on the horizontal axis.

al., 1964). In contrast, the frequency of infant cries unrelated to abuse increased as infants grew older. The increase in infant crying over the first months of infant life primarily results from the fact that mothers increasingly reject their infants (Hauser, 1993; Maestripieri, 1995; Seay et al., 1964). The temporal changes in crying frequency that occurr in monkeys contrast with those observed in humans, in whom crying tends be most frequent during the early weeks of life (Barr, 1990; Brazelton, 1962). This difference is probably due to the fact that the weaning process begins much earlier in monkeys than in humans.

If infant crying per se had an important role in triggering abuse in rhesus monkeys, the frequency of abuse should increase with infant age in parallel with the increase in infant crying. In contrast, the decrease in the frequency of abuse, along with the finding that only 8.5% of all abuse events were immediately preceded by nonabuse cries, suggest that crying is not a major determinant of abuse. Nevertheless, some differences in crying between abused and nonabused infants suggest that cries may contribute to the occurrence of abuse.

Abused infants cried more frequently than did control infants in the first 12 weeks of life, even when cries immediately following abuse were excluded from the analysis. We believe that this difference more likely results from the behavior of abusive mothers than from the abused infants being particularly fussy. Data analyses presented elsewhere showed that abusive mothers rejected their infants more frequently than did control mothers (Maestripieri, 1998). Furthermore, some abusive mothers showed a preference for carrying infants dorsally rather than ventrally, causing frequent infant crying. The frequencies with which abused and control infants were harassed by other individuals were not significantly different (Maestripieri, 1998).

The abuse screams of abused infants were different from both their own nonabuse screams and those of controls in several acoustic parameters, including call duration, call rate, and number of calls per bout. These differences are likely to reflect differences in both the causes and the function of abuse and nonabuse screams: abuse screams may be caused by pain and be aimed at interrupting abusive behavior whereas nonabuse screams may be caused by fear or hunger and be aimed at requesting contact and nursing. The percentages of positive, negative, and indifferent maternal responses to the abuse and nonabuse cries of abused infants were not significantly different. However, abuse cries were more likely than nonabuse cries to be followed by abuse. This finding is open to two possible explanations: either abuse events tend to be repeated in close temporal sequence regardless of infant crying or the acoustic characteristics of infant screams after the first abuse event increase the probability that a second event will occur. Our data do not allow us to distinguish between these two possibilities but this question could be addressed in future studies in which abuse screams are recorded and later played back to their mothers.

The nonabuse coos of abused and control infants differed in a number of acoustic features. Most notably, the coos of abused infants had low frequency and little modulation of the main frequency when compared with the coos of control infants. Interestingly, low-frequency and "flat" coos have also been reported in macaques with amygdala lesions, which are known to result in impaired emotion expression (Newman & Bachevalier, 1997). These findings suggest that the coos of abused infants may have had a lower affective component than did those of controls. The coos of abused and control infants also differed in their peak frequency position, so that whereas the coos of abused infants were as likely to have peaks at the beginning and at the end of the call, the coos of control infants had peaks mostly at the end of the call. Peak frequency position is an acoustic parameter that varies with contextual usage of the call and may elicit different behavioral responses in macaques (Moody, Stebbins, & May,

1990; but see Owren, Seyfarth, & Hopp, 1992). In rhesus macaques, infant coos commonly occur when infants are separated from their mothers, and they serve to request reestablishment of contact and nursing (Levine, Wiener, Coe, Bayart, & Hayashi, 1987). The differences in peak frequency position of the coos may suggest that abused infants tend to use coos in inappropriate contexts, thus resulting in differential responding by their mothers. Abusive mothers were less likely than control mothers to respond positively to the nonabuse cries of their infants, but our data did not allow us to assess whether this difference was primarily determined by differential responsiveness to infant coos. Thus, it cannot be ruled out that abusive mothers were generally less responsive to the cries of their infants irrespective of the cry acoustics.

Altogether, the results of this study indicate that although infant cries may contribute to the maintenance of abuse, e.g., by increasing the probability of abuse events being repeated, infant crying per se does not appear to be a major determinant of maternal abuse in rhesus monkeys. In humans, the evidence that the cries of abused infants (or children) are acoustically different from those of nonabused infants and that this difference is a major determinant of abuse is only indirect. Although some acoustic differences between the cries of atypical and normal infants have been detected, and although atypical infants may be at higher risk of abuse (Frodi, 1981, 1985), there have been no studies directly comparing cry features in abused and nonabused infants. Moreover, although abusive parents often report that crying was the event precipitating abuse (Frodi, 1981), there is no unequivocal evidence demonstrating a causal relation between crying and abuse. Thus, in both humans and primates, more studies are needed to unequivocally establish the role of crying as a determinant of abuse and, more generally, to unequivocally assess the role of characteristics of the infant (or child) versus those of the parent in the occurrence of abuse.

Two findings of our previous studies of infant abuse in monkeys suggest that maternal characteristics are important. First, abusive mothers can be distinguished from nonabusive mothers based on some differences in their parenting styles and social behavior. For example, abusive mothers score higher than controls in measures of maternal protectiveness and rejection and they tend to be more aggressive toward other group members than are controls (Maestripieri, 1998). Second, abusive mothers maltreat most of their successive infants (Maestripieri & Carroll, 1998b), and in most cases they are also consistent in the frequency and patterns of abuse displayed in subsequent years (Maestripieri, Tomaszycki, & Carroll, 1999).

However, the finding that some infants are abused less severely than their siblings (Maestripieri, Tomaszycki, & Carroll, 1999) concurs with the differences in crying reported here in suggesting that infant characteristics may contribute to the occurrence of abuse in subtle ways that have not yet been investigated. Future studies of infant abuse in monkeys should therefore include careful comparisons of physical and behavioral traits among different infants born to the same abusive mothers in relation to the frequency and severity of abuse. Further insight into the possible contribution of infant characteristics to abuse may also be provided by experiments in which infants born to abusive mothers are cross-fostered with other infants of different temperament. Such experiments would obviously be difficult or impossible to perform with humans. Therefore, research with nonhuman primates could complement research with humans and make an important contribution to our understanding of the interactions between parents and children in abusive families (Maestripieri, 1999).

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