

Infant Abuse and Neglect in Monkeys—A Discussion of Definitions, Epidemiology, Etiology, and Implications for Child Maltreatment: Reply to Cicchetti (1998) and Mason (1998)

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In response to D. Cicchetti's (1998) and W. A. Mason's (1998) commentaries, this article scrutinizes infant maltreatment in monkeys and its public health implications. Studies of infant abuse and neglect in monkeys have used operational definitions based on (a) adult behavior or (b) adult behavior and infant outcome (depending on data available for analysis). Direct comparisons between the incidence of maltreatment in monkey and human populations can be only tentative as a result of differences in operational definitions of maltreatment. A simplified version of the ecological-transactional model of maltreatment can be used in research with nonhuman primates, and different species can be used to model different aspects of the human phenomenon. Although abuse and neglect take different forms in animals and humans, research with animal models can make an important contribution to elucidating the adaptive function, if any, of child maltreatment and the proximate mechanisms underlying its occurrence.

Despite the increased epidemiological estimates of child abuse and neglect and the growing body of evidence demonstrating the negative developmental consequences of maltreatment, there seems to be a widespread belief among researchers and clinicians that the efforts currently being made to understand the causes of this phenomenon and to prevent its occurrence are largely insufficient. For example, in his commentary on our review and discussion of the animal literature (Maestripieri & Carroll, 1998), Cicchetti (1998) recognizes a parallel between our statement that little or no research with animal models of child maltreatment has recently been conducted and a statement made in the 1993 report of the National Research Council noting that there is no clear basic research or treatment agenda extant for child maltreatment. Cicchetti suggests that both the intense negative emotional reactions elicited by child maltreatment and the lack of interest or funding may be responsible for this insufficient commitment to research. We are inclined to think that, in the case of animal research, lack of information concerning the availability of animal models of child maltreatment may have also played a role. Consequently, the main goal of our critical review and discussion of the animal literature was not

to show what monkeys can reveal about child maltreatment but to inform both animal and human researchers that promising animal models of this phenomenon are already available and that new ones can and must be developed.

In his commentary, Cicchetti (1998) raises several questions concerning the definition, epidemiology, and etiology of infant maltreatment in monkeys and discusses similarities with and differences from similar issues in child maltreatment. Cicchetti also raises the question of the relevance of the animal data to human research, and this issue is further developed in Mason's (1998) commentary. In this article, we first address the issues of definition, epidemiology, and etiology raised by Cicchetti and then further discuss the implications of the animal data for human research.

Definitions, Epidemiology, and Etiology

In our recent research on infant abuse and neglect in monkeys, we obtained information from two sources, namely the long-term reproductive and clinical records of large primate colonies and the direct observation of group-living monkeys. Our operational definitions of infant abuse and neglect were, in part, constrained by our sources of information. For the analysis of the archival data, we used operational definitions that encompassed both adult behavior and its outcome (i.e., demonstration of infant injury or death) and were biased toward the most severe forms of abuse and neglect. This is because the most reliable information provided by the archival data was on severe infant abuse and neglect. The data analysis for three different species showed, among other things, that abuse and neglect did not occur together and that abuse was more frequent than neglect (Maestripieri & Carroll, in press-b; Maestripieri, Wallen, & Carroll, 1997a, 1997b). Although these findings seem to point to important differences between the monkey phenomenon and the human phenomenon, we acknowledged that they might have

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Research on infant maltreatment in monkeys was supported by grants from the Biomedical Resources Foundation, the Harry Frank Guggenheim Foundation, and, in part, by National Institutes of Health Grant RR-00165. The Yerkes Regional Primate Research Center is fully accredited by the American Association for Accreditation of Laboratory Animal Care.

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been influenced by our operational definitions of abuse and neglect. Our bias toward severe forms of abuse and neglect probably also influenced our findings concerning the epidemiology of abuse and neglect. Because of the limitations and imprecision of the epidemiological analyses of infant maltreatment in both monkey and human populations, however, whether abuse appears to be a few percentage points more or less prevalent in monkeys than in humans should not, at this point, receive too much emphasis.

In the analysis of our behavioral observations of infant abuse in monkeys, we used a definition of abuse based on the occurrence of behavior patterns that were likely to harm the infants rather than on infant outcome (Maestriperieri, 1994, 1998; Maestriperieri & Carroll, in press-a). Our definition of abuse was therefore focused on adult behavior and inclusive of both mild and severe forms of maltreatment. Incidentally, maternal protective and rejection behaviors were not considered abusive, as Mason (1998) implies in his commentary (p. 231). Recent analyses of mild and severe infant abuse in pigtail macaques (*Macaca nemestrina*) indicated that these two forms of maltreatment differed in frequency of occurrence but not in physical patterns of abuse (Maestriperieri & Carroll, in press-a). This finding suggests that mild and severe abuse are two different facets of the same phenomenon and raises the question of what determines frequency of abuse in different individuals or environmental circumstances. Our observations of infant abuse in rhesus (*Macaca mulatta*) and pigtail macaques, coupled with those previously obtained in other species and environments (Fairbanks & McGuire, 1995; Troisi & D'Amato, 1984), lend support to the conclusion derived from archival data that abuse and neglect do not occur together in monkeys. In fact, even if neglect is defined by using threshold values of maternal contact and protectiveness instead of being equated with infant abandonment, the data available indicate that abusive mothers tend to fall above rather than below these threshold values (Maestriperieri, 1998; Maestriperieri & Carroll, in press-a; Troisi & D'Amato, 1984). Therefore, the co-occurrence of abuse and neglect may represent a true difference between the primate and the human phenomena rather than an artifact of our data analysis. Nevertheless, we believe that it may be profitable for future studies of child maltreatment to attempt to separately investigate not only the etiology of abuse and neglect (Belsky, 1993) but also their potential evolutionary significance. In this regard, the animal data and parental investment theory could be used to formulate differential predictions concerning the characteristics of abuse and neglect and could contribute to enhancing understanding of these two forms of maltreatment.

The identification of infant abuse in monkeys on the basis of a set of characteristic adult behavior patterns is a relatively straightforward task, because these patterns are distinct from any other behavioral patterns in the maternal or aggressive repertoire. Moreover, these patterns of abuse are consistently observed across a variety of species and environmental circumstances. Therefore, the problems of definition that currently hamper research and intervention in the field of child maltreatment are more easily circumvented in monkeys. The use of operational definitions of maltreatment that are based on harmful adult behavior can also provide a common ground for interspecific and interdisciplinary studies of abuse. If different adult

behaviors in different species or environments can be demonstrated to have similar harmful consequences for infant biobehavioral development, this could further validate interspecific comparisons of infant maltreatment at both the theoretical and empirical levels. For example, in parallel with recent studies showing that child maltreatment can have long-lasting consequences for the activity of the hypothamic-pituitary-adrenal (HPA) axis (Hart, Gunnar, & Cicchetti, 1995, 1996), we have preliminary data showing that monkey infants that experienced mild maternal abuse early in life (i.e., abuse that did not result in any observable injury) had higher baseline levels of adrenocortico-tropic hormone (ACTH) and cortisol than controls 1–2 months after termination of abuse (D. Maestriperieri & P. Plotsky, 1997). Although an unequivocal cause-effect relationship between abuse and physiological alterations cannot be established, both human and monkey data suggest that abuse results in HPA-axis-mediated heightened responsiveness to stress.

The identification of monkey infant abuse as a set of behavior patterns that are morphologically distinct from other parenting and aggressive behaviors also makes it possible to separate the study of infant abuse from that of parenting and aggression in a way similar to what has been done for the human phenomenon (Barnett, Manly, & Cicchetti, 1993). Although most studies of infant abuse in macaques have found a consistent association between abuse and controlling or protective parenting styles (Maestriperieri, 1998; Maestriperieri & Carroll, in press-a; Troisi & D'Amato, 1984; but see Maestriperieri, 1994), it cannot be ruled out that studies of other primate species in different environments will reveal a different relationship between parenting style and abuse. In fact, we are confident that, as infant abuse and neglect are further investigated in nonhuman primates along the directions suggested in our article and in Cicchetti's (1998) commentary, these phenomena will reveal a variety of forms and determinants, both among individuals and across species, that is not apparent from current data sets. For this reason, we believe that it is important to investigate abuse and neglect in a wider range of species and environments.

We certainly welcome the application of an ecological-transactional model to the study of infant abuse and neglect in primates. Indeed, one of our main concerns about the social deprivation paradigm for studying infant abuse was its exclusive focus on one possible determinant of inadequate parenting, namely adverse early experience. In our recent studies of infant abuse and neglect in group-living monkeys, we have expanded the range of variables under investigation to include, for example, relatedness to other abusive individuals, maternal psychological characteristics, and stressful environmental circumstances. Furthermore, we are currently investigating the potential role of infant characteristics, notably the frequency and acoustic properties of infant cries, in triggering abuse. It may still be argued, however, as Cicchetti does, that the focus on the possible determinants of infant abuse in monkeys is quite narrow relative to human research, in which a wide range of potential influences on child maltreatment across the level of the individual, family, and society are currently being considered.

Although increasingly complex investigations of infant maltreatment in monkeys are both desirable and inevitable, it is worth remembering that the goal of developing an animal model of child maltreatment is not to identify or exactly reproduce in

a different species the complex and multifaceted human phenomenon in its entirety. Rather, the advantage of an animal model is that it allows scientists to investigate specific aspects of the phenomenon in question in a simplified manner and in isolation from potentially confounding influences. The inevitably narrow focus of an animal model of child maltreatment is compensated by the opportunity to develop different animal models for different aspects of child maltreatment. For example, our observations of infant abuse in macaques suggest that pigtail macaques are a better animal model than rhesus macaques for investigating the effects of social stress on abusive parenting (Maestripieri, 1994; Maestripieri & Carroll, in press-a), whereas the opposite is probably true for investigating the mechanisms underlying the intergenerational transmission of abuse.

Implications for Human Research

As pointed out by Mason (1998), it is important to both justify the choice of a particular animal model and clarify what aspects of the human phenomenon are being modeled in the animal. What makes monkey infant abuse an interesting phenomenon to study in relation to child maltreatment is not simply that monkey mothers harm their infants but that there are similarities in the overall prevalence of abuse in the population, the intergenerational transmission of abuse, the effects of early experience on abuse, some psychological characteristics of abusive parents, and the role of social stress in triggering abuse. Obviously, we deliberately choose to use the term *abuse* for the primate phenomenon to facilitate communication between primate and human researchers, just as human researchers deliberately use the term *maltreatment* for very different forms of abuse. Whether the motivation for abuse is the same in monkeys and humans is still an open question, because little is known about the motivational states underlying abuse in humans; even less is known about monkeys. Abuse obviously takes very different forms in monkeys and humans: Human parents do not drag their children by their tail, and monkey mothers do not burn their infants' skin with cigarette butts. However, this is largely irrelevant to the usefulness of a primate model. What is relevant is that there are potential similarities between monkeys and humans in the processes by which environmental, psychological, and experiential factors interact to induce maladaptive parenting behavior, whatever form this may take.

As we stressed in our article, although a number of animal species could serve as suitable models for investigating the circumstances in which parents neglect or abandon their offspring (see subsequent discussion), nonhuman primates are probably the most suitable models for investigating the complex interplay of psychological, social, and experiential variables underlying child maltreatment. Because parenting behavior in nonhuman primates is sensitive to these variables to a greater extent than in nonprimate animals, nonhuman primates offer the opportunity to experimentally test certain aspects of the ecological-transactional model of child maltreatment (Belsky, 1993; Cicchetti & Lynch, 1993) in a simplified manner.

Mason (1998) argues that, in our article, we tacitly assumed that infant abuse is based on homologous processes in human and nonhuman primates; in his view, this is unlikely to be the case. Saying that infant abuse in monkeys is homologous to

child abuse in humans is equivalent to saying that this phenomenon was present in a common ancestor and was maintained in both monkeys and humans during their subsequent evolutionary divergence. Homology also implies that abusive behavior has a strong genetic component, because genes are the primary substrate of evolution. Because neither the evolutionary history of parental abusive behavior nor its possible genetic determinants have been investigated in humans or in nonhuman primates, believing that monkey infant abuse is likely or unlikely to be homologous to human child abuse amounts to little other than a preconception.

Whether or not monkey infant abuse is homologous to human child abuse is a question that can be answered only by future research, and until such research is conducted, homology cannot be used as an argument either in favor or against the relevance of the primate data for humans. Therefore, we did not imply that monkey infant abuse may be homologous to human child abuse. In fact, we did not imply homology for neglect either. Rather, we pointed out that parents in a variety of species are selected to reduce or terminate investment in their offspring whenever the costs of parental care outweigh its benefits (e.g., in environmental circumstances in which the probability of offspring survival is low). Termination of parental investment may take very different forms in animals and humans (e.g., human parents do not cannibalize their offspring). However, analogies between the situations eliciting offspring neglect and the function of neglectful behavior across animals and between animals and humans make animal models a potentially important tool for understanding this phenomenon.

Although we agree with Mason that extrapolations from animal to human behavior are more likely to be valid if they are based on homologies, it is worth remembering that the criterion of homology is, unfortunately, often ignored in current choices of animal models for biobehavioral research. For example, rodents are used far more commonly than nonhuman primates in research related to mental health, mostly for logistic and economic reasons and despite the fact that homologies (as well as analogies) are less likely to be found between humans and rodents than between human and nonhuman primates.

Paradoxically, however, recommendations of caution in extrapolating from the animal to the human data seem to be more common for research conducted with nonhuman primates than for research conducted with nonprimate animals. This may be due, at least in part, to the ethical and emotional issues associated with research with nonhuman primates, including perhaps a reaction to a perceived threat to 'human uniqueness.' Although recommendations of caution are undoubtedly aimed at improving the quality of research and interpretation of data, placing systematic emphasis on the differences between humans and the other primates rather than on their similarities may have the counterproductive effect of favoring the attitude, mentioned by Mason, that opposes all forms of psychological research with animals. In this view, one possible answer to Mason's question of how close is infant maltreatment in monkeys to child maltreatment is that it is close enough to hasten some people to state that it is different.

We agree with Mason (1998) that all animals are worthy of study in their own right. In our current society, however, in which research resources are limited and not all individuals are

equally motivated by the pursuit of knowledge, investments in research are being increasingly prioritized in relation to the research's immediate potential of improving the health and living conditions of human beings. Research with animal models of infant abuse and neglect has the potential to make an important contribution to a serious societal problem that, each year, claims the lives of almost 1,000 children in the United States alone (U.S. Department of Health and Human Services, 1997) and produces lifelong physical and psychological impairments in millions of other children throughout the world. It is important, therefore, that both scientists and their sponsors leave preconceptions aside and make the best possible effort to understand and prevent this phenomenon.

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Received November 17, 1997

Accepted November 18, 1997 ■