

The Emergence of Affiliative Behavior in Infant Spotted Hyenas (*Crocuta crocuta*)^a

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Theories on the function of play generally consider that the benefits on physical development, learning, or socialization are delayed until adulthood, but the payoffs of play may be more immediate.¹ We documented behavioral development in the infant spotted hyena (*Crocuta crocuta*) and argue that early play is best explained if it is considered to have immediate socialization benefits.² Inferences are drawn from a behavioral progression that correlates with a changing schedule of social pressures. Notably, cubs are initially sequestered at a natal den, but at 2-6 weeks of age, they are transferred to a communal den where they meet most clan members for the first time.³ At the natal den, the precocial cubs, who are born with their eyes open and canines fully erupted, engage in intense, potentially siblicidal aggression within minutes of birth.⁴ The narrow structure of underground dens prevents entry by large predators, but also constrains maternal contact.³ Together, cub aggression and restrictions on maternal intervention seem incompatible with successful integration of infants within the clan. We propose that cubs must arrive at the communal den with a behavioral repertoire that permits the development of affiliative as well as competitive social relationships.

METHODS

We investigated the time course of early social development in eight litters of captive spotted hyena twins at the Field Station for Behavioral Research of the University of California, Berkeley. As in nature, mothers and their cubs were isolated from other animals; unlike the natural situation, however, mothers had continuous access to their cubs. We monitored animals from birth through 1 month, recording all aggression, submission, prosocial behavior, social and solitary play, exploration, and maternal behavior. We analyzed developmental changes in sibling interactions and maternal behavior by comparing the mean weekly frequency and duration of each action pattern.

^aThis work was supported by National Institutes of Health grants HD07684 and MH39917.

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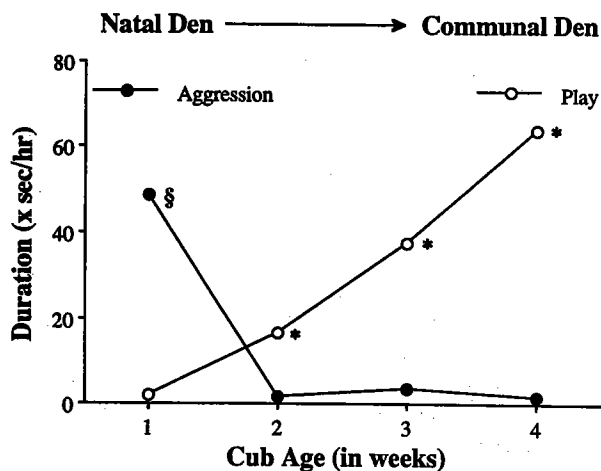


FIGURE 1. Mean \pm SE hourly rates for the duration of bite shakes (●), the most intensely aggressive behavior between spotted hyena siblings, and for total social play (○), during the first month of life. Bouts of aggression lasted longer in week 1 than weeks 2, 3, or 4 (§ $ps < 0.01$), but total social play showed steady weekly increases (* $ps < 0.05$). Behavioral differences correlate with a changing social environment.

RESULTS

The most extreme aggressive behavior peaked immediately after birth⁴ and declined markedly after week 1 (FIG. 1). Dominance relationships were established within days, were strongly unidirectional (with subordinate cubs accounting for 92-100% of withdrawals), and showed no subsequent reversals.⁵ Low-intensity prosocial behavior emerged in week 1, occurring primarily between mother and cub, then gradually increased across weeks, occurring primarily between siblings (FIG. 2). Higher-intensity social play (e.g., play wrestling) emerged in week 2 and steadily increased in frequency, duration (FIG. 1), and vigor. Locomotor and object play did not emerge until weeks 3 and 4, respectively. Aggression and play occurred as simultaneous elements of the behavioral repertoire, providing an opportunity to examine the structural relation between the two. Bouts of playful biting were initially equal in length to bouts of aggressive biting, but eventually grew longer, potentially reflecting the exaggerated quality of play. Whereas aggression was primarily initiated by dominant cubs, play was equally initiated by dominant and subordinate cubs. Lastly, given continuous access to their cubs, mothers interrupted extreme sibling aggression, but not vigorous play.

DISCUSSION

A reorganization of infant spotted hyena behavior occurred at about 2 weeks of age. This developmental schedule is ideally synchronized for introduction of young

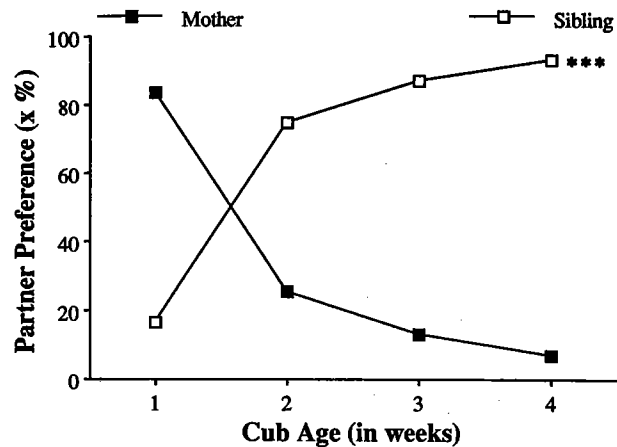


FIGURE 2. Mean percentage of total hyena cub engagement in prosocial activity directed towards its sibling (\square) or its mother (\blacksquare) during the first month of life. Cubs engaged in prosocial behavior with their mother less than with each other ($F_{s,1,7} > 6.9$, $ps < 0.05$) and showed a change in partner preference across weeks ($F_{s,3,21} > 4.9$, $ps \leq 0.01$), tending to be more prosocial with their mother during week 1, but showing increasing preference for their sibling that reached significance by week 4 ($p < 0.001$).

cubs to peers and other clan members at the communal den. The change in pattern included a rapid reduction in aggression, the establishment of a stable dominance relationship, the emergence of a peer preference during prosocial interactions, and the development of vigorous social play. The absence of a temporal correlation between aggression and play suggests that the two reflect different underlying systems in the behavioral repertoire of the spotted hyena. We argue that whereas aggression helps to establish dominance and hone competitive abilities, play helps to establish affiliative relations and promote social cohesion.

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ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

Volume 807

**THE INTEGRATIVE
NEUROBIOLOGY
OF AFFILIATION**

*Edited by C. Sue Carter, I. Izja Lederhendler, and
Brian Kirkpatrick*

*The New York Academy of Sciences
New York, New York
1997*