Temperament in Cocaine-Exposed Infants

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An infant cries in a high-pitched voice, sleeps irregularly and feeds poorly, rarely smiles, and does not seem very responsive to stimuli. A preschooler can never seem to sit still, often changes mood without any apparent reason, and has a very short attention span even during play. A child is easily distracted in school by outside noises, gives up easily when an answer to a question is not known, and shows very little interest in learning. Can the concept of temperament provide a framework to better understand these behavioral differences? We believe that it can. There is converging evidence that suggests that cocaine exposure may affect behavioral domains linked to underlying temperamental differences. In this chapter, we employ the framework of infant temperament to examine the behavior of cocaine-exposed infants. The particular focus is on the temperament of cocaine-exposed infants and on the role it plays in learning, emotional responsivity, and social functioning. Is there a cluster of temperamental characteristics that typifies the cocaine-exposed infant? If so, is the cocaine-exposed child's ability to learn, emotional expression, and regulation compromised as a function of these characteristics? We begin with a selective review of the temperament literature, emphasizing the role of temperament in learning and emotional behavior and prenatal and postnatal factors that influence temperament. We then explore the interplay between temperament, learning, and emotional responsivity in cocaine-exposed infants. Finally, the relation between temperament and caregiver–infant interactions is discussed.
TEMPERAMENT IN INFANCY

Much attention has been given to the definition and measurement of temperament in infancy, with numerous reviews of the construct and its assessment appearing in recent years (Bates, 1987; Bornstein, Gaughran, & Homel, 1985; Goldsmith & Campos, 1982, 1986). Although no single definition of temperament has gained universal acceptance, most researchers would agree that temperament includes individual behavioral differences in attention, affective expressiveness, motor activity, soothability, and self-regulation (Campos, Barrett, Lamb, Goldsmith, & Stenberg, 1983; Derryberry & Rothbart, 1984; Goldsmith et al., 1987; Thomas & Chess, 1989). Thus, temperament can be observed behaviorally at all ages as individual differences in patterns of emotionality, activity, and self-regulation. Such individual differences are presumed to have genetic and psychobiological bases, although the environment is seen as a factor that molds temperament styles (Buss & Plomin, 1984; Rothbart & Derryberry, 1981; Thomas & Chess, 1980).

A wide variety of instruments have been developed to measure temperament in infants and young children. Assessment of infant temperament is typically based on parental report (questionnaires more than interviews), observer ratings, and direct behavioral recording. The most prevalent type of temperament measure in infancy is parental report. Parental reports are used because they allow sampling of the infant’s behavior over a range of occasions and situations that are difficult to achieve in laboratory and home visits. Direct observations of temperament in the laboratory or home have been proposed as a means of validating maternal assessment. These methods are vulnerable to distortion because the period of observation is short and the range of behavior may be constricted. Moreover, there are few standard contexts for measuring temperament in the laboratory though there are several currently being developed (Bates, 1989). Parental report of their experiences with their infants are, therefore, of value in the measurement of temperament. In a review of studies that have compared maternal ratings of infants with observational data, Bates (1989) concluded that there is a modest to moderate objective basis in parental perceptions.

On an intrapersonal basis, temperamental behavioral tendencies show some degree of stability and cross-sectional generality (Goldsmith & Campos, 1986). Continuity in temperament beginning in early infancy and over several years has been found for “behavioral inhibition” (Garcia-Coll, Kagan, & Reznick, 1984; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984). Moreover, individual differences in anger and sadness expressions have been reported to persist over the first 18 months (Izard, Hembree, Dougherty, & Spizzirri, 1983). Several studies show continuity in maternal reports of activity level throughout the first year (McDevitt & Carey, 1981; Peters-Martin & Wachs, 1984; Rothbart, 1981). Other data based on parental report rather than behavioral coding are consistent with this view of continuity (Izard & Malatesta, 1987, for a review). Thus, there is evidence that the major temperament concepts are somewhat stable during infancy, whether measured by parent report or direct observation.
Temperament and Learning

There is converging evidence to support the assertion that learning performance is related to individual differences in behavioral style. For example, Piagetian levels of sensorimotor performance are significantly correlated with several dimensions of infant temperament such as attention and persistence (Carey & McDevitt, 1978). Similarly, Bayley Scale mental performance scores were positively correlated with temperament dimensions such as reactivity, persistence, and attention span (Matheney, Dolan, & Wilson, 1974). In addition, Keogh (1982) found that persistence not only predicted IQ and grades in school but also correlated with teachers' estimates of ability when IQ was held constant.

Undesirable temperamental characteristics, on the other hand, such as susceptibility to distress, fear of novel stimuli, and low frustration tolerance can result in behavioral disorganization, which can be disruptive in an immediate learning situation and possibly limit future opportunities for cognitive growth through faulty parent-child interactions. There is some data to support the notion that "difficult" infants show cognitive delays (Field, Hallock, Ting et al., 1978; Sostek & Anders, 1977; Thomas & Chess, 1977). Taken as a whole, it appears that at least some temperamental factors influence performance on cognitive tasks, especially those that require attention and persistence.

In this regard, there is some evidence to indicate that temperament may be related to the ease with which infants learn a simple operant response. The infant's rate of learning may reflect a psychobiological preparedness to learn. This does not refer to cognitive capacity but to the infant's ability to engage in arousing and challenging environmental events. Theorists who advocate a biological-evolutionary perspective of temperament (e.g., Buss & Plomin, 1984) argue that genetic factors influence individual differences in behavioral styles, which, in turn, would be expected to influence predispositions to learn. In instrumental conditioning studies, however, the relation between learning and temperament is inconsistent. Krafchuk, Sameroff, and Barkow (1976) reported that high activity level was significantly correlated with operant learning. Dunst and Lingerfelt (1985) also reported that the temperament dimensions of persistence and rhythmicity were significant correlates of learning rates during conditioning. On the other hand, Alessandri, Sullivan, and Lewis (1990) found that the ease with which infants learned an operant response did not depend on the behavioral styles they brought to the situation.

Rothbart and Derryberry (1981) hypothesized that attention span and duration of orienting along with latency to approach sudden or novel stimuli (fearfulness) are behavioral processes that promote self-regulation in learning situations. For example, Fagen and Ohr (1985) found that crying in response to changes in mobile complexity could reliably be predicted by the temperamental dimensions of activity level, duration of orienting, and distress to sudden or novel stimuli. However, a subsequent study revealed that the prediction of group membership
(criers/noncriers) was more reliable only for females (Fagen, Ohr, Singer, & Fleckenstein, 1987). Further studies that examine the use of temperament measures as part of infant conditioning studies are needed to determine the mutual contributions of individual differences and environmental factors in learning.

**Temperament and Emotional Behavior**

Although the concepts of temperament and emotion have been linked by many theorists, Goldsmith and Campos (1982, 1986) offered a direct link between temperament and emotion. They viewed temperament as interacting with or as a moderator of other intrapersonal variables such as emotion. In fact, they have provided a theoretical mapping of the major temperament dimensions and their correspondence to discrete emotions described by Ekman and Friesen (1975) and Izard (1983). It is possible, therefore, to match temperament dimensions, particularly those of Rothbart (1986) with the facial expressions of Izard (1983). For example, the temperament dimension of smiling or laughter is likely to correspond to joy, distress to limitations to anger, fear (Rothbart) to fear, and persistence to the expression of interest.

According to Goldsmith and Campos (1982), temperament can be viewed as structures that organize the expression of emotion which, in turn, regulate parent–child social interactions. Expressive behaviors have social-communicative value, especially with respect to the issue of emotion socialization. Affective signals are salient and compelling elicits of responses between caregiver and infant. Affective exchanges between caregivers and infants provide infants with one of the earliest occasions for the learning of display rules as well as individual-familial expressive patterns (Lewis & Saarni, 1985). It has been demonstrated that caregivers react in specific ways to their infants’ expressions of emotions, and that these differentiated responses may affect subsequent emotional development (Brazelton, Koscowski, & Main, 1979; Malatesta & Haviland, 1982).

The responsiveness of caregivers to their infants and the type of emotion socialization in which they engage are not, of course, unrelated to infant characteristics. Temperamental characteristics can play an important role in shaping the child’s social environment, including what materials and resources are available, what demands are placed upon him or her, what stresses are present, and what social behaviors are provided. The infant’s temperament regulates and is regulated by the actions of others very early in life. The contingency or lack of contingency with which caregivers respond to infant signals has been of considerable interest in studying emotion socialization. It is now understood that establishing synchrony in caregiver–infant interactions involves not only contingent responsiveness between infant and caregiver, but also the caregiver’s tuning in to the infant’s temperamental characteristics (Bornstein, 1989). Individual differences in temperament will influence dyadic interaction and regulation provided by the caregiver (Rothbart, 1984). It is easier to be sensitive, interactive, and accepting with infants
who are easy to manage than it is with those who are difficult. Grossman, Grossman, Spangler, Suess, and Unzner (1985) demonstrated the way in which such infant temperament characteristics as ability to orient and ability to tolerate frustration affect the nature of the interactions that caregivers have with their infants. In this regard, research comparing the variability of temperamental characteristics among at-risk and normal infants is important for identifying individual differences that may be of consequence to the caregiver–infant relationship.

Pre- and Postnatal Risk Factors and Infant Temperament

Two types of clinical conditions can potentially influence the child’s temperament. The first is established organic pathology such as genetic, chromosomal, and other congenital anomalies, and postnatal insults to the central nervous system. The other consists of risk factors such as prematurity or exposure to toxins, in which organic pathology may or may not be documented in the child. Studies with clinical samples that examine the relations between pre- and postnatal factors and behaviors conceptually related to temperament are relatively sparse.

In studies of infants with Down’s syndrome, it has been found that they are rated lower on scales that measure smiling and laughter, activity level, and threshold for stimulation. Infants with Down’s syndrome also have higher scores on scales that measure fear and startle behaviors (Bridges & Cicchetti, 1982; Gunn & Berry, 1985; Rothbart & Hanson, 1983). On the other hand, Greenberg and Field (1985) found that normal and infants with Down’s syndrome were rated less difficult than infants who were delayed, had cerebral palsy, or had sensory impairments. Descriptive studies of infants with nonorganic failure to thrive reveal several temperamental characteristics such as low activity level and minimal smiling (Gaensbauer, 1982; Leonard, Rhymes, & Solnit, 1986; Powell & Low, 1983).

Several studies have examined the relation between prematurity and temperament. Parents of preterm infants tend to rate their infants’ temperaments as more difficult during the first year of life (Field, Hallock, Dempsey, & Shulman, 1978; Schraeder & Medoff-Cooper, 1983; Spungen & Farran, 1986). Preterm infants are less rewarding initially because it takes them longer to show alerting behaviors, to regulate their sleep–waking patterns, and to respond socially (Field, Sostek, Goldberg, & Shuman, 1979). Their motor organization is poorer and their states of arousal are less well modulated.

In the preterm infant, the caregiver is faced with a less adept social partner, one at risk for subsequent interactive difficulty. In fact, research indicates that the dyadic relationship of preterms both begins and remains more disadvantaged than that of term infants (Field, 1987). Parents of preterm infants make less body contact with them, spend less time interacting with them in face-to-face play, smile at and touch them less, and appear to be emotionaly withdrawn (Field, 1987; Goldberg, Brackfield, & DiVitto, 1980). Thus, individual differences in
affective responsivity from birth suggest that prenatal and postnatal events can influence infants' emotional predispositions.

COCAINE EXPOSURE IN UTERO
AND EMOTIONAL BEHAVIOR

Studies have documented neurobehavioral problems in cocaine-exposed neonates that include hyperirritability, poor feeding patterns, and irregular sleeping patterns, which may be related to temperament (Doberczak, Shanzer, Senie, & Kandall, 1988; Fulroth, Phillips, & Durand, 1989; Oro & Dixon, 1987; Shih, Cone-Wesson, Reddix, & Wu, 1989). In studies using the Brazelton Scale, cocaine-exposed neonates showed diminished interactive behavior and poor state organization (Chasnoff, Burns, Schnoll, & Burns, 1985, 1986; Chasnoff & Griffith, 1991; Dixon, Coen, & Crutchfield, 1987). There are inconsistencies in the literature, however, and the pathogenesis of these observations is not clearly understood.

Reports of follow-up beyond the newborn period still are sparse due, in part, to methodological problems and sample selection, and in the identification and measurement of confounding variables. In a study of 1-month-old infants, Lester et al. (1991) found that both excitable and depressed cry characteristics were related to in utero cocaine exposure. Excitable cry characteristics (e.g., long duration, high fundamental and variable frequency) were directly related to cocaine exposure and may reflect withdrawal effects, whereas depressed cry characteristics (e.g., few utterances, low amplitude) were due to the indirect effects of cocaine secondary to low birth weight. According to Lester et al. (1991), the depressed cry characteristics suggest a decrease in functional activity or underaroused behavior that may reflect more chronic effects of early and prolonged cocaine exposure.

Schneider and Chasnoff (1987) found that cocaine-exposed toddlers performed adequately on cognitive measures, but had poor concentration, organizational, and motor skills. Similar findings were reported in a 2-year follow-up of a cohort of cocaine- or polydrug-exposed infants (Chasnoff, Griffith, Freier, & Murray, 1992). On the Bayley Scales of Infant Development, there was no difference in mean developmental scores between drug-exposed and control infants. The researchers concluded, however, that the highly structured tasks on the Bayley may have masked self-regulatory difficulties experienced by drug-exposed children (Chasnoff et al., 1992). Ratekeeping, Beckwith, and Howard (1991) examined quality of attachment in children prenatally exposed to phencyclidine (PCP) and cocaine. They reported that the majority of drug-exposed infants were insecurely attached to their caregivers and that this did not differ in three caregiving environments in which the infants were being raised (e.g., mother care, kinship care, or foster care).

Taken together, these findings may be interpreted as indicating that cocaine exposure in utero may affect, among other things, infant temperament. For
example, Alessandri, Sullivan, Imaizumi, and Lewis (1993) reported that infants exposed to cocaine showed less overall arousal in a learning situation and expressed less interest and joy during learning and anger when frustrated. Such deficiencies in arousal and emotional responsivity may be partly due to cocaine exposure.

TEMPERAMENT IN COCAINE-EXPOSED INFANTS

We recently collected data that examine the relations among temperament, learning, and emotional responsivity in cocaine-exposed infants. We selected the Rothbart (1978) Infant Behavior Questionnaire (IBQ) as the measure of temperament from among the two dozen or so instruments currently available (Bates, 1987). The IBQ was chosen because it purports to measure individual differences in reactivity and self-regulation that may have a constitutional base, such as activity and emotionality (Rothbart, 1986) and because a primary goal in its construction was to investigate both developmental continuity and change in infant behavior as observed by the caregiver in the home (Rothbart, 1981). Moreover, unlike other temperament scales, the IBQ does not ask for the mother's opinion of her infant or require her to make comparative judgments about the infant. Instead, the items refer to the presence of specific behaviors in specific situations. There are six scales on the IBQ: activity level—gross motor activity, including squirming and arm and leg movement; smiling and laughter—smiling or laughter in any situation; fear—distress and latency to approach a sudden or novel stimulus; distress to limitations—distress during caretaking procedures (e.g., waiting for food, getting dressed and undressed) or when prevented access to a goal; soothability—reduction of fussing and crying in response to soothing efforts; and, duration of orienting—vocalizing and looking at or interacting with an object for extended periods of time. Validation support for the use of the IBQ has been established in both home (Rothbart, 1986) and laboratory settings (Goldsmith & Campos, 1986).

Results indicated that cocaine-using mothers rated their infants on the IBQ lower in activity level, smiling and laughter, and distress to limitations compared to nonusing mothers who were equated in all respects except for cocaine use. Means and standard deviations for the six IBQ dimensions by group are presented in Table 14.1. Following Rothbart (1986), smiling and laughter and activity were collapsed into a factor that termed positive reactivity, and fear and distress to limits were collapsed into negative reactivity. Results indicated that cocaine-using, relative to nonusing mothers, rated their infants as lower in both positive reactivity and negative reactivity. Mothers' ratings of their infants' behavior were consistent with our behavioral observations of their infants in the laboratory. As reported by Alessandri et al. (1993), cocaine-exposed infants showed less overall arousal and activity during contingency learning and expressed fewer positive and negative emotions than infants not exposed to cocaine.
### Table 14.1

Means and Standard Deviations for the IBQ Dimensions by Group

<table>
<thead>
<tr>
<th>IBQ Dimension</th>
<th>Cocaine (n = 36)</th>
<th>Nonc Cocaine (n = 36)</th>
<th>F (1,70)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity level</td>
<td>M 3.73' SD .91</td>
<td>M 4.41 SD .72</td>
<td>7.00**</td>
</tr>
<tr>
<td>Smiling/laughter</td>
<td>M 3.72 SD .85</td>
<td>M 4.96 SD 1.03</td>
<td>11.02**</td>
</tr>
<tr>
<td>Distress to limits</td>
<td>M 3.15 SD .70</td>
<td>M 3.62 SD .86</td>
<td>5.10*</td>
</tr>
<tr>
<td>Fear</td>
<td>M 2.76 SD .74</td>
<td>M 2.99 SD .72</td>
<td>1.46</td>
</tr>
<tr>
<td>Soothability</td>
<td>M 4.93 SD .94</td>
<td>M 5.38 SD .93</td>
<td>2.04</td>
</tr>
<tr>
<td>Duration of orienting</td>
<td>M 3.80 SD .89</td>
<td>M 3.66 SD .70</td>
<td>.76</td>
</tr>
<tr>
<td>Positive reactivity</td>
<td>M 3.73 SD .48</td>
<td>M 4.68 SD .62</td>
<td>14.54**</td>
</tr>
<tr>
<td>Negative reactivity</td>
<td>M 2.95 SD .52</td>
<td>M 3.30 SD .66</td>
<td>4.96*</td>
</tr>
</tbody>
</table>

Note. IBQ = Infant Behavior Questionnaire.

*p < .01. **p < .001.

### Temperament and Caregiver-Infant Interaction

These data along with those of Alessandri et al. (1993) suggest that cocaine-exposed infants tend to be compromised in their capacities for participation in the subtle give-and-take of interaction, and communication about their states and needs through smiles, frowns, cries, and eye contact. Given the lower activity level and lower affective responsivity in cocaine-exposed infants, the caregiver is faced with a difficult task of modulating his or her stimulation to match the infant’s arousal and stimulation needs. Such temperamental differences in cocaine-exposed infants may require parents to adapt their style to accommodate their infant’s disposition toward lower activity and emotional inhibition. For example, the infant who responds less and expresses fewer affective behaviors may be unresponsive because of higher sensory thresholds or less developed arousal-modulation and information-processing skills. The caregiver who is sensitive to the need for higher levels of stimulation will attempt to modify the level and variety of stimulation to the infant. Caregivers must learn to understand the nature of their infants' needs and successfully adapt their caregiving behavior. The overly placid infant who, in the long run, may be in greater need of stimulation, may receive less by virtue of his or her calmness. Individual differences in infants, therefore, necessitate modifications by caregivers to achieve successful patterns of relatedness.
It is possible, however, for caregivers to have rewarding, reciprocal relationships with infants who manifest atypical patterns of development. For example, caregivers of preterm infants who exhibit less overall activity in response to stimulation and fewer positive responses are more likely to engage in more physical contact and to offer and demonstrate more toys to their infants (Field, 1977). These data suggest that caregivers can learn to make adjustments to their preterm infants by investing more effort in their interactions with their less responsive and less active infants. Caregivers must also employ compensatory mechanisms, such as substituting vocal contact for the missing visual channel in congenitally blind infants (Fraiberg, 1979). Mothers of deaf infants also compensate for their infants’ diminished responsiveness and less active involvement by being more dominant (Meadow, Greenberg, & Erting, 1983). What may appear to be overstimulation to the observer may be the manifestation of a contingently responsive caregiver who, in making compensatory adjustments in their parenting style, encourage the adaptation of the infant.

Temperament differences in cocaine-exposed infants may influence the optimal level of caregiver stimulation and emphasize that the child needs to be taken into account in planning intervention programs. Caregivers of cocaine-exposed infants need to learn the way in which infant characteristics such as low activity level, lags in social smiling, and low frustration tolerance affect the nature of their interactions with their infants. Moreover, caregivers of cocaine-exposed infants may need to adopt their caregiving style to their infant’s disposition in order to maximize their infant’s development. That is, caregivers must play a more active role in helping cocaine-exposed infants generate enough affect to become emotionally engaged in social interaction. This is no easy task, however, because the parents of cocaine-exposed infants themselves often have past and/or present experiences that can compromise their ability to meet the needs of their infants. Factors such as poverty, a history of child abuse, family instability and violence, and a history of psychiatric illness can compromise a caregiver’s ability to parent. Because of the highly addictive nature of cocaine, drug-abusing mothers are at risk for dysfunctional parenting and failure in meeting the special needs of their infants, which may significantly contribute to developmental morbidity. Some studies have found that mothers are less engaging with their infants if they are difficult or irritable (Crockenberg & Acredolo, 1983; Linn & Horowitz, 1983) and relations have been reported between early interactional disturbances and later, school-age behavioral and emotional problems including short attention span, hyperactivity, and disturbed social interactions (Bakeman & Brown, 1980; Field, 1984).

Thus, children who experience prenatal exposure to cocaine are even more at risk when they do not experience the consistent parenting children need to thrive, and may, therefore, be at greater risk for poorer developmental outcomes at later ages. Although resiliency and change are always possible for the child and for the adult, resiliency cannot be taken for granted. Interventions that provide
education and support to the caregiver and take into consideration the cocaine-exposed child's needs are likely to be the most effective in promoting the child's future development. This approach recognizes that fetal exposure to cocaine compromises or jeopardizes developmental processes but that organismic and environmental factors can contribute to positive developmental outcomes. However, the mitigating influence of a positive childrearing environment on developmental outcomes for cocaine-exposed children is yet to be determined. In this chapter the question is raised as to whether the construct of temperament will facilitate understanding of individual differences in learning and emotional responsiveness, particularly among cocaine-exposed infants. We observed that temperament is typically understood as behavioral differences in affective expressiveness, motor activity, stimulus sensitivity, and self-regulation. We examined the role of temperament in learning and emotional behavior in normal populations and, finally, we presented data representing our initial efforts toward a working assessment of the interplay among temperament, learning, and emotional responsivity in cocaine-exposed infants. Cocaine-using mothers rated their infants lower on the temperament dimensions of activity level, smiling and laughter, and distress to limitations. Our laboratory observations during a learning-contingent procedure confirmed a pattern of less engagement in the task among cocaine-exposed infants. The social communicative role of temperament, at least in terms of what the infant brings to the caregiver–infant relationship, has important clinical implications. Given that temperament is likely to influence the optimal level of caregiver stimulation suggests that the particular needs of the cocaine-exposed infant be taken into account in planning intervention programs. Caregivers of cocaine-exposed infants need to learn the ways in which temperamental characteristics such as low activity level, lags in social smiling, and limited emotional responsiveness affect the nature of their interaction with their infants. Teaching caregivers to adopt their caregiving style to meet the needs of their infants is likely to significantly contribute to positive short-term and, potentially, long-term developmental outcomes.

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REFERENCES

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