
SPECIAL SECTION COMMENTARY

Emotional relationships between mothers and infants: Knowns, unknowns, and unknown unknowns

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Abstract

An overview of the literature pertaining to the construct of emotional availability is presented, illustrated by a sampling of relevant studies. Methodological, statistical, and conceptual problems in the existing corpus of research are discussed, and suggestions for improving future investigations of this important construct are offered.

Consider three studies of young infants and the implications they hold for early and enduring emotional relationships:

1. Four-month-olds are more distressed during a maternal still-face than during physical separation, suggesting that mothers' emotional unavailability is more troubling to young infants than their physical absence (Field, Vega-Lahr, Scafidi, & Goldstein, 1986).
2. Social referencing demonstrates that very young children use parents' emotional expressions as guides in approaching or withdrawing from both physical and social stimuli (Sorce, Emde, Campos, & Klinnert, 1985).
3. In an ambiguous situation, a mother's physical presence but emotional unavailability engenders displeasure and inhibits her child's exploration, whereas her emotional availability (EA) has a significant effect on the child's affective, social, and exploratory behaviors (Sorce & Emde, 1981).

Consider also the following:

4. In a sample of 3000 adults, ages 25–74, from the US National Survey of Midlife Development, early parental emotional support (acts of caring, acceptance, and assis-

tance) proved a principal predictor of mental and physical health in adulthood, associations that persisted into the seventh decade of life (Brim et al., 1996).

A substantial (and ever enlarging) body of research exists on the emotional relationship that develops between a mother and her infant. A baby comes into the world totally dependent on adults for survival but also equipped with a set of characteristics and behaviors capable of eliciting attention and care from them. In addition to having a mother, it is necessary that the baby establish a focused relationship with her. Above and beyond the mere existence of that relationship, however, its *quality* is critical to fostering multiple developmental achievements in the child: solid senses of self, trust in others, and effectance. Relationship quality in turn depends on the fit among the infant's needs and capacities to respond, the mother's provision of necessary experiences, and the emotional tone of their interactions. Preverbal infants and mothers normally use emotional cues as primary sources of information when relating to each other. Seen in this light, emotional exchanges constitute mothers' and children's "first (extremely complex) language" with one another. The emotional availability (EA) construct is intended to capture the degree to which both mother and infant are accessible and able to respond appropriately to one another's emotional signals (Biringen & Robinson, 1991). Furthermore, because emotional relationships unfold over time it is critical to adopt a developmental perspective to understand processes underlying individual pathways to adaptive and maladaptive outcomes.

In this article, we attempt to connect emotions to emotional relationships and to their measurement and meaning. A wealth of information on EA in mother–child relationships now exists. We touch on what is now known as well as on the

Note that in the title we use the term mother both specifically and generically: specifically because the vast majority of the literature in adult/caregiver–child relationships has focused on mothers and generically to stand for mothers, fathers, grandparents, siblings, daycare providers, and so forth, all of whom interact with young children. Preparation of this article was supported by the Intramural Research Program of the NIH, NICHD.

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large gray area beyond current knowledge of unknowns and unknown unknowns.

Knowns

Emotions and emotional relationships

Human experience is inherently emotional, and human beings experience the world and others in it emotionally. Emotions arise from and form the foundation for many aspects of human attachments, social communication, and pro-social encounters (Emde, 1980). Contagion, instigation, and exchange of emotions are core features of human interaction, and emotions are powerful intra- and interpersonal regulators of behavior. Children's ability to regulate attention, emotion, and arousal develops in the context of their primary caregiving relationships during infancy and appears to be fundamental for the balance of the life span in organizing behavior, social relationships, and adaptive functioning (Sameroff & Emde, 1989; Sroufe, 1996). In consequence, EA constitutes a key feature of both parenting and children's development (Bornstein, 2000).

Emotional interactions normally include both signaling and understanding in each partner, resulting in the emotional accessibility of one to the other (Biringen & Robinson, 1991; Emde, 1980, 2000; Emde & Easterbrooks, 1985). Expressing emotions through their voices, faces, and gestures, mothers engage their children, direct and maintain child attention, and build rhythms of expectable dyadic interaction (Bornstein, Gini, Putnick, et al., 2006; Martin, Clements, & Crnic, 2002; Weinberg & Tronick, 1996). Reciprocally, children provide multiple cues that express their emotional states and needs to their mothers (Barnard & Solchany, 2002). Reciprocal positive emotional sharing is indispensable to healthy caregiving and wholesome mother-child relationships and provides an important context for nurturing positive development in children (Aviezer, Sagi, Joels, & Ziv, 1999; Biringen & Robinson, 1991; Bretherton, 2000; Lovas, 2005).

EA

Dyadic EA (Biringen, 2000; Biringen & Robinson 1991), an operationalization of shared emotional processes, refers to the quality of emotional exchanges between mothers and their children. EA encompasses both emotional signaling and emotional understanding in the partners as well as the emotional accessibility of one to the other (Biringen & Robinson, 1991; Emde, 2000; Emde & Easterbrooks, 1985). EA likely arises from constitutional needs and organismic development on the one hand and is shaped by situation-specific experiences and contexts on the other. A relationship construct, EA has been referred to as the "connective tissue" in mother-child relationships (Easterbrooks & Biringen, 2000, p. 123). Focus on EA constitutes a process-level understanding of adaptive and maladaptive, normal and abnormal, trajectories of development (Cicchetti & Toth, 2009). The emotionally available

dyad is one in which both mother and infant recognize the other partner's signals and affirm them. If a mother approaches her infant psychologically in a respectful, accepting, contingent manner, the infant enjoys interacting with her. This openness (reciprocity) on the infant's part encourages continued interaction of the same quality from the mother.

A mother and her baby are partners in the child's socialization. The basic behavioral agenda involved in the socialization process is common to all human mothers and infants, unfolds in part automatically, and hopefully results in healthy child outcomes. Regardless of the set of circumstances in which mother and infant find themselves, they must and do interact with each other from the moment the child is conceived. An Eskimo baby who trusts his mother will learn from her whatever she needs to teach him to survive and prosper in the Eskimo culture, just as the trusting baby in Seoul will learn how to function in Korean society. An Eskimo or Korean dyad with a less harmonious emotional exchange climate will be hampered in achieving desired socialization goals. EA conceptualizes a fluid two-way exchange where signals and behaviors from both partners constantly affect each other in bidirectional transaction (Bornstein, 2009; Sander, 2000; Stern, 1985; Trevarthen & Aitken, 2001; Van Egeren, Barratt, & Roach, 2001; Venuti, de Falco, Guisti, & Bornstein, 2008). EA describes the open, eager, collaborative, reciprocal communication that can occur between a mother and infant under optimal conditions, regardless of their culture, place of residence, or socioeconomic status.

Measuring EA: The EA Scales

EA is evaluated through observations and ratings of mother-infant interaction using the EA Scales. The EA Scales assess specific behaviors of individuals but at the same time are meant to constitute global ratings of dyads that capture joint interactional style. The scales are flexible with respect to age of child, relationship between child and caregiver, and setting. The EA Scales have been used with children of different ages (e.g., Biringen, Brown, et al., 2000; Easterbrooks, Biesecker, & Lyons-Ruth, 2000); with mothers, fathers, and other caregivers in low and high social-risk populations (e.g., Oyen, Landy, & Hilburn-Cobb, 2000; Swanson, Beckwith, & Howard, 2000); and in a wide variety of different nations, including Argentina, Australia, Belgium, Canada, Finland, Germany, Israel, Italy, Latvia, The Netherlands, Portugal, Sweden, and Turkey (Biringen, 2005; Bornstein et al., 2008; Oyen et al., 2000; Sagi, Koren-Karie, Gini, Ziv, & Joels, 2002; Ziv, Aviezer, Gini, Sagi, & Koren-Karie, 2000).

The EA Scales consist of six globally rated dimensions concerned with emotional communication and interaction. Four scales assess maternal behavior: sensitivity, structuring, nonintrusiveness, and nonhostility. Two scales capture infant/child behavior: responsiveness and involvement of mother. Although descriptive of the behavior of one actor, each scale is coded by observing that actor *in interaction with* the second actor, so the rating of one actor's behavior takes the partner's

responses to it into account. Together, EA ratings yield assessments of the dyad's level and style of emotional functioning from six different behavioral perspectives. Each scale has a cut-point above which the dyad is presumed to be functioning in a manner sufficient to meet each partner's emotional needs and below which the dyad is believed to be at risk for negative sequelae. A more complete description of the EA Scales can be found in Biringen and Easterbrooks (2012).

Psychometrics

Reliability, stability, and continuity. Reliability and stability are defined as consistency across time or context in the relative ranks of individuals in a group in the short- and long-term, respectively. Continuity describes group mean level comparison. Reliability/stability and continuity are statistically independent and reflect conceptually distinct realms of development (Bornstein & Bornstein, 2008; McCall, 1981; Wohlwill, 1973); that is, rank order and mean level analyses assess different features of development across time or context. Studies employing multiple assessments of the EA Scales across time or context have shed light on the reliability/stability and continuity of EA, although not all investigators report both rank order and mean level, and few have studied context (see Table 1 for illustrations). Reliable individual differences in EA across shorter periods of time are conceived to reflect characteristics of the dyad. The extant literature supports short-term reliability of EA both in infancy and in toddlerhood. EA is also moderately stable from infancy to toddlerhood. EA evidences short-term continuity in infancy (Bornstein, Gini, Putnick, et al., 2006) and toddlerhood (Bornstein, Gini, Suwalsky, Putnick, & Haynes, 2006) and long-term continuity between infancy and toddlerhood

in the child, but maternal sensitivity, structuring, and nonintrusiveness change across this developmental period (Bornstein et al., 2010).

Validity. Validity is the extent to which an instrument measures what it claims to measure. A growing body of literature using the EA Scales shows that both mother and child components of EA relate to key aspects of the mother-child relationship (for reviews, see Biringen, 2000; Pipp-Siegel & Biringen, 1998) as well as to maternal characteristics (Biringen, Matheny, Bretherton, Renouf, & Sherman, 2000; Easterbrooks, Chaudhuri, & Gestsdottir, 2005; Ziv, Sagi, Gini, Karie-Koren, & Joels, 1996) and child behaviors (Pressman, Pipp-Siegel, Yoshinaga-Itano, & Deas, 1999; Sagi, Tirosh, Ziv, Guttman, & Lavie, 1998; Wiefel et al., 2005). Notably, the EA Scales have been examined in relation to concurrent and longitudinal measures of attachment (see Easterbrooks & Biringen, 2000, 2005a, 2005b).

Analysis

The EA Scales lend themselves to complementary analyses from "variable" (individual) and (two types of) "person" (dyad) perspectives (Bornstein, Gini, Suwalsky, Putnick, & Haynes, 2006). The more common variable approach to assessment uses single variables or combinations of variables as the main conceptual and analytical units (Hartmann, Pelzel, & Abbott, 2011). Here, a single datum for an individual derives psychological meaning from its position relative to the positions of data from other individuals on a given dimension. Some mothers are high in sensitivity, others low. However, the configuration of multiple individual variables in a system also has meaning and yields unique information about

Table 1. Reliability and stability of the Emotional Availability Scales (illustrative, not exhaustive)

	Short Term	Long Term
Reliability/stability		
Mother	Robinson, Little, & Biringen (1993); Ziv, Gini, Guttman, & Sagi (1997); Biringen, Matheny, Bretherton, Renouf, & Sherman (2000); Lovas (2005); Bornstein, Gini, Putnick, et al. (2006); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006)	Robinson, Little, & Biringen (1993); Ziv, Gini, Guttman, & Sagi (1997); Biringen, Matheny, Bretherton, Renouf, & Sherman (2000); Lovas (2005); Howes & Obregon (2009); Bornstein et al. (2010); Bornstein, Putnick, & Suwalsky (in press); Easterbrooks, Bureau, & Lyons-Ruth (2012)
Child	Robinson, Little, & Biringen (1993); Ziv, Gini, Guttman, & Sagi (1997); Biringen, Matheny, Bretherton, Renouf, & Sherman (2000); Lovas (2005); Bornstein, Gini, Putnick, et al. (2006); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006)	Robinson, Little, & Biringen (1993); Ziv, Gini, Guttman, & Sagi (1997); Biringen, Matheny, Bretherton, Renouf, & Sherman (2000); Lovas (2005); Howes & Obregon (2009); Bornstein et al. (2010); Bornstein, Putnick, & Suwalsky (in press); Easterbrooks, Bureau, & Lyons-Ruth (2012)
Continuity		
Mother	Bornstein, Gini, Putnick, et al. (2006); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006)	Biringen, Emde, Campos, & Appelbaum (1995); Biringen et al. (1999); Biringen et al. (2000); Lovas (2005); Bornstein et al. (2010); Stack et al. (2012)
Child	Bornstein, Gini, Putnick, et al. (2006); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006)	Biringen, Emde, Campos, & Appelbaum (1995); Biringen et al. (1999); Biringen et al. (2000); Lovas (2005); Bornstein et al. (2010); Stack et al. (2012)

the individual or dyad. The person approach to analysis is based on a wholistic–interactionistic perspective on development and functioning that sees the dyad as an organized whole, developing and functioning as a totality (Magnusson & Allen, 1983). In the person approach, each datum derives its psychological meaning from its place in a pattern of data representing positions on latent dimensions under study. The totality derives its characteristic features and properties from interactions among its elements rather than from the effect of isolated parts of the totality or as an integration of variables. At the individual level, a person analysis would focus on the combination of maternal or child scale scores; at the dyad level, such an analysis would focus on combinations of maternal and child scale scores.

Findings

Illustrative examples from the existing EA literature appear in Figure 1 and Table 2. Taken together, these studies establish EA as an important factor in mother–child relationships that can be reliably and validly assessed with the EA Scales.

Sources of EA

Infant behaviors. For infants, facial expression, vocalization, and exploration serve as principal behavioral expressions of state of arousal as well as cognitive, communicative, emotional, and social functioning. These behaviors are frequent and prominent, ones that mothers monitor closely and to which they respond. Bornstein, Hahn, Suwalsky, and Haynes (2011) reported that infant looking at mother, smiling, and efficient exploration of objects within reach correlate with responsiveness. Both negative facial expression and distress vocalization are inversely related to responsiveness. Amount of infant smiling also differentiates dyads with varying levels of maternal EA. The more infants smile, the more emotionally available are their mothers. In contrast, no association obtains between infant cry and maternal EA (Esposito, Venuti, de Falco, & Bornstein, 2009). Responsiveness also correlates with maternal age (Bornstein, Hahn, Suwalsky, et al., 2011).

Maternal behaviors and characteristics. Bornstein, Hahn, Suwalsky, et al. (2011) reported that maternal bathing and child grooming and language correlate with sensitivity. Parenthood at young ages is generally associated with less favorable maternal behavior (Barratt & Roach, 1995; Coley & Chase-Lansdale, 1998; Moore & Brooks-Gunn, 2002; Pomerleau, Scuccimarrì, & Malcuit, 2003). For example, teen mothers are less verbal, less sensitive, and less responsive to their children than older mothers, and they tend to provide a less stimulating home environment (Culp, Appelbaum, Osofsky, & Levy, 1988; Luster & Dubow, 1990; Moore, Morrison, & Greene, 1997), but maternal age is positively associated with richer, more responsive, and more abundant speech to infants and toddlers (e.g., Berlin, Brady-Smith, & Brooks-Gunn, 2002; Field, 1981; Osofsky & Osofsky, 1970; Rowe, Pan, & Ayoub,

2005). Regardless of maternal age, most mothers and children fall into adequately functioning ranges of the EA Scales (Bornstein, Hahn, Suwalsky, et al., 2011). However, maternal age correlates with maternal EA Scales: as maternal age increases, so do sensitivity and structuring (Bornstein, Hahn, Suwalsky, et al., 2011; Bornstein, Putnick, Suwalsky, & Gini, 2006). Controlling for several demographic characteristics, teenage mothers are more intrusive than adult mothers (Bornstein, Putnick, et al., 2006).

Other maternal characteristics are associated with EA. Maternal education and intelligence correlate positively with sensitivity (Bornstein, Hahn, Suwalsky, et al., 2011; Bornstein, Hendricks, Haynes, & Painter, 2007), as do maternal intelligence and family socioeconomic status to responsiveness. Mothers' openness in personality as well as their knowledge of child development and parenting relate to both maternal sensitivity and infant responsiveness (Bornstein et al., 2007). These findings illustrate some of the (surely many) conditions and factors that influence the development and expression of EA between a mother and her baby and demonstrate the necessity of investigating contextual facilitators of and constraints on the quality of early emotional relationships.

Unknowns

The study of mother–infant EA has still many unresolved issues. In research to date, some important assumptions about and fundamental characteristics of EA have been glossed over and need to be addressed. The following issues are some that call for future work.

Measurement

Biringen and Easterbrooks (2012) suggest that dyads should be observed for a minimum of 20 min before ratings with the EA Scales are made. However, observation periods reported in the EA literature range from 5 to 60 min. The findings of previous studies using 10- to 15-min observations lend credence to the validity of these temporal parameters in measuring EA (see Easterbrooks et al., 2000; Swanson et al., 2000; Ziv et al., 2000), although longer observations might be recommendable (Biringen, Damon, et al., 2005). Investigators must allow mother–child dyads enough time to settle into their typical interaction style before assessing EA if they seek valid data. The context of the interaction (e.g., home vs. laboratory) has been shown so far to be less important to the expression of EA than are individual differences in dyads (Bornstein, Gini, Putnick, et al., 2006; Bornstein et al., 2008).

Because of their dyadic nature, the EA Scales are correlated to varying degrees. On the one hand, empirical evidence seems to suggest that two of the four maternal scales (at least sensitivity and structuring) as well as the two child scales (responsiveness and involvement of mother) correlate highly with one another. In most studies, mother and child scales also intercorrelate. This covariation has been ignored, and statistical

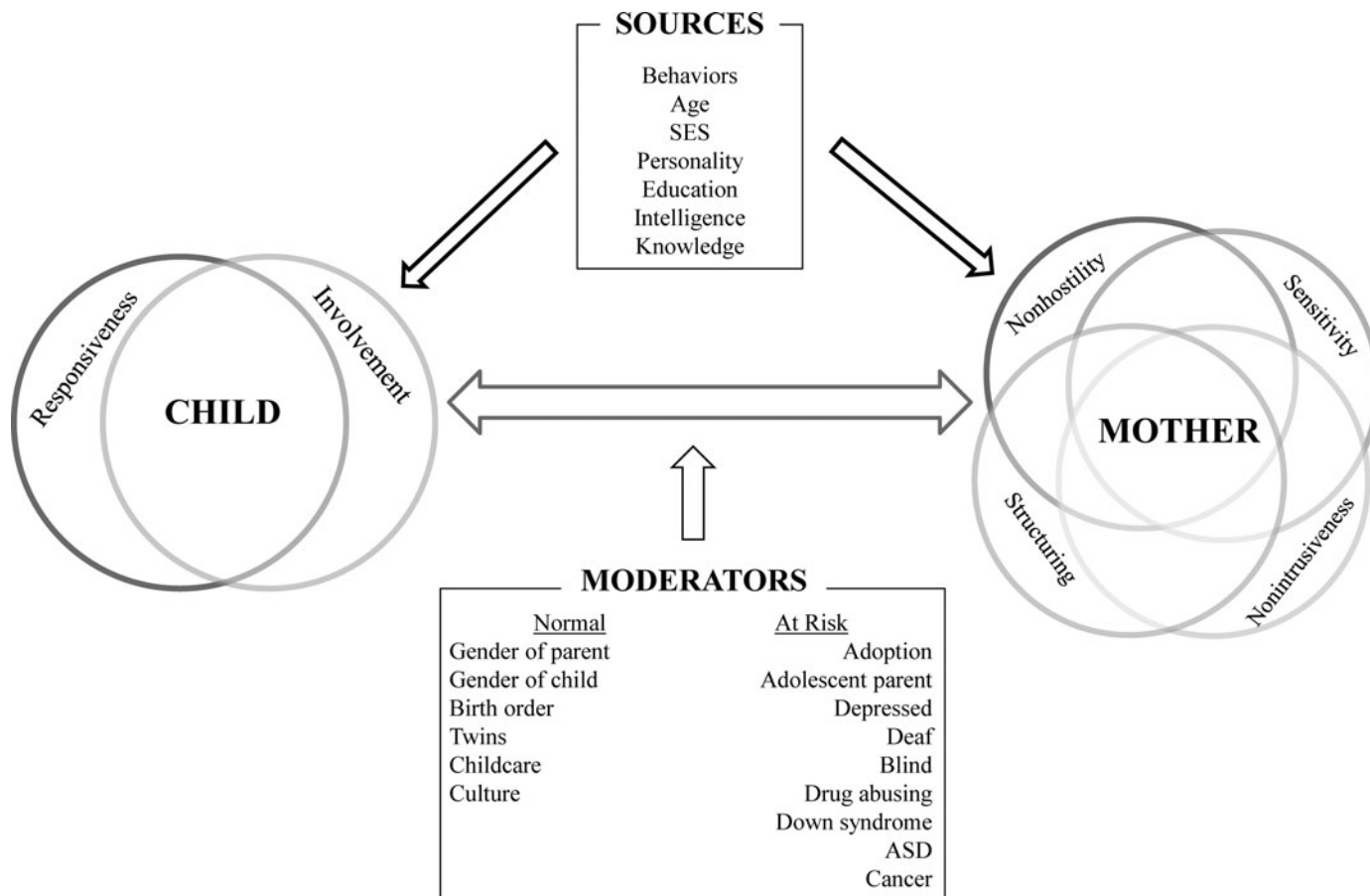


Figure 1. The emotional availability in mothers and children: a guide to their associations, sources, and moderators. SES, socioeconomic status; ASD, autism spectrum disorder.

Table 2. Group comparisons of Emotional Availability Scales (illustrative, not exhaustive)

Comparison	Reference
Gender	
Parent	Ziv, Aviezer, Gini, Sagi, & Koren-Karie, (2000); Volling, McElwain, Notaro, & Herrera (2002); Lovas (2005); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006); de Falco, Venuti, Esposito, & Bornstein (2008)
Child	Robinson, Little, & Biringen (1993); Biringen, Robinson, & Emde (1994); Robinson & Biringen (1995); Biringen et al. (1999); Ziv, Aviezer, Gini, Sagi, & Koren-Karie (2000); Lovas (2005); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006); Bornstein et al. (2008); de Falco, Venuti, Esposito, & Bornstein (2008); Bornstein et al. (2010)
Within family	
Firstborn–secondborn	Bornstein, Putnick, & Suwalsky (2011b)
Twins	Robinson & Little (1994); Venuti, Giusti, Gini, & Bornstein (2008)
Childcare	Cost, Quality, and Outcomes Study (1995); Zimmerman & McDonald (1995); Burchinal & Cryer (2003); Zimmerman & Fassler (2003); NICHD Early Child Care Research Network (2006); Bornstein, Putnick, & Suwalsky (2011a); Biringen, Altenhofen, et al. (2012)
Culture	Aviezer, Sagi, Joels, & Ziv (1999); Biringen (2000); Easterbrooks & Biringen (2000); Easterbrooks & Biringen (2005b); Bornstein, Gini, Putnick, et al. (2006); Bornstein, Gini, Suwalsky, Putnick, & Haynes (2006); Bornstein et al. (2008); Chaudhuri, Easterbrooks, & Davis (2009); Howes & Obregon (2009); Bornstein et al. (2010)
At risk	
Adoption	Garvin, Tarullo, Van Ryzin, & Gunnar (2012); van den Dries, Juffer, van IJzendoorn, Bakermans-Kranenburg, & Alink (2012)
Adolescent parent	Culp, Applebaum, Osofsky, & Levy (1988); Frankel, Lindahl, & Harmon (1992); Barratt & Roach (1995); Culp, Osofsky, & O'Brien (1996); Berlin, Brady-Smith, & Brooks-Gunn (2002); Moore & Brooks-Gunn (2002); Zimmerman & Fassler (2003); Bornstein, Putnick, Suwalsky, & Gini (2006); Chaudhuri, Easterbrooks, & Davis (2009)
Depressed	Easterbrooks, Biesecker, Lyons-Ruth, & Carper (1996); Easterbrooks, Biesecker, & Lyons-Ruth (2000); Biringen, Vliegen, Bijttebier, & Cluckers (2002); Vliegen et al. (2005); Killeen & Teti (2012)
Deaf	Koester, Brooks, & Traci (1996); Pipp-Siegel, Blair, Deas, Pressman, & Yoshinaga-Itano (1998); Pressman, Pipp-Siegel, Yoshinaga-Itano, Kubicek, & Emde (1998); Biringen, Fidler, Barrett, & Kubicek (2005)
Blind	Campbell (2007); Campbell & Johnston (2009)
Drug abusing	Swanson, Beckwith, & Howard (2002); Fraser, Harris-Britt, Thakkallapalli, Kurtz-Costes, & Martin (2010); Bornstein, Mayes, & Park, (2011)
Down syndrome	Lovas (2005); de Falco, Cimmino, La Femina, & Venuti (2008). Venuti, de Falco, Giusti, & Bornstein (2008); de Falco, Venuti, Esposito, & Bornstein (2008)
Autism spectrum disorder	Biringen, Fidler, Barrett, & Kubicek (2005); Dolev, Oppenheim, Koren-Karie, & Yirmiya (2009); Koren-Karie, Oppenheim, Dolev, & Yirmiya (2009); Oppenheim, Koren-Karie, Dolev, & Yirmiya (2009)
Cancer	Bornstein, Scrimin, et al. (2011)

analyses have been reported as though the scales were independent. On the other hand, it appears that sensitivity sometimes gives a pattern of results that is not the same as structuring, or vice versa. Why such “unique” relations should emerge when component scales are correlated is unclear but worthy of investigation. Future studies should consistently report correlations among scales and consider their meaning when interpreting results. This issue also raises the question of whether researchers should continue to emphasize and use all scales, select one or another as representative of the dyad, or (perhaps) create composites of them. Consensus on this score would greatly strengthen future research.

Interpretation

The same behavior or set of behaviors can enhance dyadic functioning or impede it depending on how both partners experience it. The “both” is critical. Caregiving ministrations or

interaction sequences believed by a mother to be appropriate may not be if her infant does not respond positively to them. The tickling mother is a delight for the baby with a high sensory threshold, but a source of pain for the baby with a threshold that is low. The tickles may be the same in both relationships, but emotional reactions to these may differ dramatically. The baby who vocalizes frequently is perceived by the mother who seeks stimulation as a source of fascination and endless amusement, whereas the mother who feels overwhelmed by a perceived need to respond to every signal of her baby will hear those vocalizations with irritation and despair. The dyadic nature of the EA Scales sets them apart from single-actor coding systems. However, deep tensions between dyadic versus monadic operationalization, analysis, and interpretation of data pervade the extant EA literature. The confusion is not just that scales are labeled “mother” or “child,” but (echoing an earlier critique) analyses consistently treat them independently. How the scales are construed makes a critical differ-

ence in how results based on them are interpreted. Sensitivity cannot be construed as a maternal characteristic or responsiveness as a quality of the child. Rather, both scales assess behavioral manifestations of the mutuality that has developed between a particular mother and a particular child. Moving forward, it behooves investigators to be more precise and consistent in the way they conceptualize and interpret measures of EA. Increased rigor in this respect will benefit the entire field and deepen our understanding of this very complex construct.

Predictive validity

The value of EA as a developmental construct will turn to a large degree on its long-term meaning. Developmental analysis highlights the critical role of timing in the organization of behavior and it underscores multiple determinants (Cicchetti & Pogge-Hesse, 1982). The literature to date generally supports the important role that EA in mother–child relationships plays for children’s healthy development, although much research remains to be done in this regard.

Socioemotional status in children. Maternal sensitivity has been linked to a host of positive child characteristics and outcomes in domains such as independence, social responsibility, self-confidence, self-esteem, and aggression (Maccoby & Martin, 1983; Pettit & Bates, 1989). Pianta, Smith, and Reeve (1991) found that aspects of observed mother–child interaction prior to school entry (particularly maternal supportive presence and quality of instruction, and child affection to mother and task orientation) predicted children’s adjustment and competence in kindergarten as rated by teachers. Kogan and Carter (1996) found that EA during free play is associated with reunion behavior after the still-face situation.

Cognitive status in children. Pressman, Pipp-Siegel, Yoshinaga-Itano, Kubicek, and Emde (2000) reported that maternal as well as child EA in a group of mother–toddler pairs predicted children’s language gains 2 years later in a sample of deaf/hard of hearing children. EA has also been shown to predict variance in “school readiness” (Biringen, Skillern, Mone, & Pianta, 2005).

Unknown Unknowns

We pose the following questions for the next generation of scientists as they pursue a more in-depth understanding of the origins, mechanisms, and developmental consequences of varying degrees of EA in the mother–child relationship. What is experienced of an emotional nature by each partner when interactions are synchronous and when they are not? How do emotional responses shape continuing interactions? What are the emotional characteristics and mechanisms involved in dyadic disjoint? What characteristics of the mother and child enable him or her to “read” the other’s signals accurately so as to contribute to emotionally satisfying interactions? A frontier in the study of EA will be to grasp these emo-

tional processes at the physiological level. In another area, work lies ahead in probing the deeper constructs underlying EA. What, for example, is the nature of hostility and how do variations in its expression influence children’s behavior and development? The levels of the EA Scale need to be more precisely delineated so as to help generate more focused research questions and assist with the interpretation of results. The highest level of sensitivity, for example, is “optimal.” What does optimal mean? Definitional consensus will contribute to comparability across investigations. Several editions of the EA Scales have been published, with wide variation in which versions are used, often without clear citation, across studies. How will the new 4th edition fare? How will the EA Scales behave with proper statistical controls? How do family socioeconomic status and/or parental education affect EA within dyads? How do parental beliefs and behaviors correlate with EA? How does social support affect EA? What are the origins of EA in mothers and children? Can we successfully intervene to enhance EA? All of these and other questions remain unanswered, calling for thoughtful investigation.

Conclusions

The construct of EA and its operationalization in the EA Scales is appealing. The scales place primary emphasis on the mother–infant dyad and the relationship that develops within it; they focus research attention on the centrality of emotional influences in early development; they also differentiate among various behavioral domains that contribute to the emotional climate that develops within the dyad. The qualitative nature of the scales captures the subtle nuances and coloring of behavior. The scales highlight individual differences in relationships and promote appreciation of the wide range of conditions under which adaptive functioning in children can and does develop. The fact that the burgeoning literature on EA addresses the issue from multiple perspectives (as demonstrated by studies in this Special Section)—from maternal brain activity through contextual influences like parental abuse, the experience of child care, and the pervading effects of culture—is heuristic and helps consolidate what we know about EA while also exposing areas still needing research.

One can think of the mother–child dyad as a sort of docking mechanism that generates energy both for parenting and for child development. A new infant must connect to a parent figure to ignite the potential to develop. The process is reciprocal; the (developing) infant stimulates the mother who in turn nurtures the baby. Energy for one partner or process does not exist without energy for the other. But the quality of the energy and its optimal generation will vary depending on the “fit” of infant and mother with one another. The fit need not be perfect (and never is), but the nature of the dyadic relationship that is established depends on the goodness of the fit.

Emotions are presumably adaptive and guide survival strategies in parenting and development. Experiences that function to promote the survival of the infant should (and will) be ex-

perienced as positive (a loving touch, a soft voice, a full tummy, a dry diaper, a colorful mobile, a soothing lullaby), and the infant's behavioral response will reflect his or her acceptance of them. Experiences that endanger survival should (and will) be experienced as negative (hunger, a protracted wait for mother to appear when she is needed, absence of maternal affect, intrusive handling, overstimulation) and will elicit distress or withdrawal in the baby. The infant is designed to find the human face, voice, and touch interesting and pleasurable but will stop responding to them positively if the mother does not tailor her ministrations to the infant's capacity to receive them. The infant's response in turn engenders emotional reactions in the mother that shape her ongoing parenting. In this way, mother and infant take each other's measure and jointly shape the dyadic path they travel together.

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