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Emergent Themes in the Study of Emotional Development and Emotion Regulation

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Makes explicit a reconceptualization of the nature of emotion that over the past decade has fostered the study of emotion regulation. In the past, emotions were considered to be feeling states indexed by behavioral expressions; now, emotions are considered to be processes of establishing, maintaining, or disrupting the relation between the organism and the environment on matters of significance to the person. When emotions were conceptualized in the traditional way as feelings, emotion regulation centered on ego-defense mechanisms and display rules. The former was difficult to test; the latter was narrow in scope. By contrast, the notion of emotions as relational processes has shifted interest to the study of person/environment transactions in the elicitations of emotion and to the functions of action tendencies, emotional "expressions," language, and behavioral coping mechanisms. The article also treats the importance of affect in the continuity of self-development by documenting the impressive stability of at least two emotional dispositions: irritability and inhibition.

As Dodge (1989) noted in his comments opening this special section on emotion regulation, it has proved very difficult to define the inclusion and exclusion criteria that characterize human emotions. As a result, consensus about the definition of emotion eludes us. Nevertheless, working assumptions about the characteristics of emotion do determine the questions that researchers ask. Such assumptions illuminate certain phenomena and leave others in the dark; moreover, changes in such assumptions permit novel approaches to important yet neglected issues.

In this article, we will argue that major changes are taking place in the conceptualization of emotion and will point out that some of the implications of these changes are not yet widely recognized. These changes focus on new ways of considering how emotions are elicited, what the functions of emotion are in the adaptation of humans to their social and nonsocial world, and how emotions lay the basis for important enduring personality dispositions (Malatesta, in press). Because Dodge has provided an excellent and succinct summary of the five articles that constitute this special section in his opening article, and because he has documented the interrelations among the five articles very clearly, the objective of this commentary will be to describe what we think is the *zeitgeist* of which these articles are a part and to which they add impetus. We will also highlight important emergent issues in the area of emotional regulation that were either underemphasized in the articles or left out altogether. Our purpose, therefore, is to complement the other articles in this special section, rather than to review them.

Emotion: From Structure to Function

We mentioned above that even in the absence of consensus, working definitions determine the nature of the questions asked and the phenomena investigated. Ten years ago, a special section of this journal devoted to emotional regulation would have been unthinkable. Our working definitions of emotions precluded such an interest. At that time, the most prevalent conceptualization of emotion was one of *emotion as a special subjective state.* This is a view best summarized by Clore and Ortony's (1984) statement that ". . . the subjective feeling state has a special status that cannot be properly considered as a *component* of emotion at all—it *is* the emotion" (p. 53, their emphases).

This view of emotion as a purely intrapsychic and internal process was consistent with both the layman's implicit theory of emotion and with common linguistic allusions to feelings of internal bodily sensations such as "butterflies in the stomach," "lump in the throat," "nauseous with disgust," "the heat of anger," and so on. It was also consistent with the classic theories of emotion, like those of James (1890) and Cannon (1927), which tried to explain the origins of central feeling states. Indeed, the personological view of emotion is well exemplified at the end of James's influential chapter in the *Principles of Psychology* (1890), in which he noted that emotions "terminated in the subject's own body" and did not go beyond the body to influence external events.

The central issue for emotion theory from 1890 to the early 1980s was to account for this unique state of consciousness. At first, interest was devoted to facial (Tomkins, 1962) or autonomic (Mandler, 1975) feedback. More recently, interest has centered on cognitive factors (Case, Hayward, Lewis, & Hurst, 1988; Lazarus, 1968; Lewis & Michalson, 1983; Rozin & Fallon, 1987; Schachter & Singer, 1962; Spitz, 1965; Sroufe, 1979). As a result, researchers interested in feeling as criterial for emotion proposed that processes such as person and object permanence (Sroufe, 1979), the development of self-recognition (Lewis & Michalson, 1983), the onset of means–ends relations (Scarr & Salapatek, 1970), or the growth of short-term memory (Case et al., 1988) made possible the experience of emotion.

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The regulation of emotion (i.e., the control of emotional experience and expression by the self and others) has often not been considered at all or has been conceptualized as a corollary to cognitive development and, thus, not in need of separate investigation.

Moreover, because feeling states are not readily measurable, hypotheses about feeling regulation seemed untestable. A case in point is Bowlby's (1973) speculation about the defensive structures that are presumed to underlie the stages of grief, despair, and withdrawal that followed traumatic maternal separation. Although his behavioral description of the sequence of reactions to separation was generally accepted, Bowlby's theoretical interpretations about feeling regulation have remained speculative. Similar problems have beset the psychoanalytic concepts of the "stimulus barrier" in early infancy (Tennes, Emde, Kisley, & Metcalf, 1972) and the role of representation of the mother as the basis for the emotion of sadness (Spitz, 1965).

This view of emotion as secondary to cognition is still evident in the study of the development of emotions and of emotion regulation. For instance, in her article in this issue, Kopp (1989) describes the baby as "becoming human" in the third month of life, presumably when perception, memory, learning ability, and other indications of cognitive development have begun to be consolidated. She also postulates that emotion regulation is secondary to developments in means–ends behavior, semantic comprehension, and language. Lewis (e.g., Lewis & Michalson, 1983) takes a similar view about the importance of cognition, proposing that emotions such as embarrassment or shame emerge only when the child develops an understanding of the self as an object that is identifiable as separate from other objects.

Today, emotions are beginning to be viewed in a very different light by a number of researchers; there is a new working definition of emotion emerging that renders the study of feeling and of cognition/emotion relations incomplete. According to this new working definition, emotions are not mere feelings, but rather are *processes of establishing, maintaining, or disrupting the relations between the person and the internal or external environment, when such relations are significant to the individual* (Barrett & Campos, 1987; Frijda, 1986). According to this view, three processes make an event significant to the human: (a) the relevance of an event to the goals and strivings of the person; (b) the emotional communication from significant others, such as their facial, vocal, and gestural actions; and (c) the hedonic nature of certain types of stimulation (that is, whether an event intrinsically hurts, soothes, or produces pleasure). Thus, cognitive factors such as object permanence, mirror self-recognition, and short-term memory are not, in themselves, affectogenic; for cognition to produce emotion, the cognition must be about significant events. To postulate cognition alone in emotion elicitation and emotion regulation is to miss half of the tale.

Furthermore, to consider only the intrapersonal aspects of emotion is similarly incomplete. One of the important implications of this change in conceptualization is that emotions are given both intrapersonal and interpersonal regulatory consequences. For example, joy has the function of maintaining the organism's behavior: The joyful person is likely to keep up what he is *doing*, and he or she is simultaneously *signaling* to others to keep up their interaction with the individual (Emde, 1988). The feeling of joy, therefore, is both a monitor of successful progress toward an environmental goal and a basis for organizing expressive signals that also have environmental consequences (Frijda, 1986).

Sadness, on the other hand, occurs when a relation with the environment is relinquished. The person–environment relation can exist either with another person or with an object. The characteristic resignation of sadness occurs when action is deemed unlikely to be successful in attaining a goal (i.e., "learned helplessness": Seligman, 1975). The social signals that accompany sadness function to elicit succorance, that is, to obtain help in what the person appreciates is a situation that he or she can probably no longer do anything about. Thus, the social signals of sadness are also relational. They are calls to others in the surround.

Anger occurs when the person tries to overcome an obstacle to the attainment of a goal. The feeling, the expression, and the action are understandable as attempts to interact with the environment by mobilization of energy to overcome the obstacle. Such anger-induced arousal accounts for why these three facets are rather similar to those of effort (Frijda, 1986). The interpersonal consequence of anger is also relational (i.e., to elicit submission from another). Thus, anger, like joy and sadness, is relational, insofar as the emotion concerns how the organism is trying to deal with events in the world. Furthermore, when emotion is elicited by the appreciation of the social signals of others—their sadness, joy, fear, or disgust—emotion is also relational: Each human can be bonded to the other by affective attunement (Stern, 1985) or repelled from the other by affective rejection and abuse (see Gottman & Fainsilber Katz, 1989, as well as Rieder & Cicchetti, 1989). So, in sum, according to this working definition, emotion is the way the event, the person, and the person's appreciation of significance are interrelated.

This relational view of emotion is not componential; it does not attempt to analyze elicitation, signification, and reaction into discrete systems, although in exposition one inevitably reverts to componential language. In this sense, the view articulated here differs from theories, such as that of Lang (1984) or of Izard and Malatesta (1987), that otherwise appear similar in postulating that cognition, action, and physiology are ingredients in the generation of emotion. It differs from Lang's approach in particular, insofar as the components stressed by Lang downplay the relational, communicational, and interpersonal aspects of emotion.

The new relational view differs from prior viewpoints in giving equal status (a) to the person's appreciation of the significance of an event, (b) to the individual's feelings, which are now considered to be monitors of the significance of both events and coping potential relative to those events, rather than mere registrations of autonomic or facial feedback, and (c) to the way that a person deals with his or her environment. This conceptualization broadens one's view of emotion far beyond previous concerns with the nature of feeling. As noted above, no longer is emotion considered to be solely intrapersonal. Moreover, this relational view renders emotion regulation central to emotion theory, because both the appreciation of the significance of events and the types of reactions that the organism makes to

events are crucial phases of both the generation and the control of affect.

At least three factors account for the shift to a relational view of emotion (see Campos, Barrett, Lamb, Goldsmith, & Stenberg, 1983). One is *systems theory* (Buckley, 1968), with its emphasis on end-states, equifinality, and intrinsic organizational properties (Fogel & Thelen, 1987). Another is *ethology,* which stresses communication, ecological niches, and the functions that actions serve (Blurton-Jones, 1972). The third is the *organizational approach to emotional development,* which postulates that the same event can have many different emotional reactions and that different responses can have the same underlying emotional meaning (Campos et al., 1983; Cicchetti & Sroufe, 1978; Emde, 1980; Sroufe, 1979).

Implications of the New Conceptualization of Emotion

We now consider the major critical implications of the relational approach to emotion for emotion theory, emotion measurement, and emotion regulation.

1. **At least four previously neglected factors are given increasingly important roles in the generation of emotions.**

First, *motivational processes* (i.e., goals and strivings) are proposed as explanations of why the same environmental event can elicit dramatically different affective reactions. An example may be helpful here. When a child is engaged in playing intently, a mother's interactional bid to the child can be intrusive and disturbing. On the other hand, when the child is lonely or fearful, the same bid can be comforting and welcome. If the interactional bid results in the child's giving up play, the child can become disappointed. Thus, the emotional outcome of the transaction depends critically on the motivational context on which the event impinges. One consequence of this view is the contemporary emphasis on the construct of "maternal sensitivity" to the desires of the child—a factor that appears to underlie the formation of secure attachment relations both in infants and children (Ainsworth, Blehar, Waters, & Wall, 1978; Bretherton, 1985).

Second, *the emotional signals of another guide action and can generate a similar emotional state in the perceiver.* The concept of social referencing (Campos & Stenberg, 1981) illustrates the important way in which the emotional signals of others are used by individuals to disambiguate environmental events and to regulate their course of action in relation to those uncertain events. Moreover, when social referencing or the imposition of emotional signals by the caregivers become repetitive, dispositions toward action are created, and these dispositions, at least in part, underlie what we call the "value system" of a culture. Thus, emotional signaling can have pervasive and enduring regulatory significance.

Moreover, as Haviland & Lelwica (1987) noted, emotional signaling can create emotional contagion. Thus, the perception of smiling begets joy, the detection of fear generates wariness, and the sight or sound of sadness in the other can elicit distress in the observer. Even anger shown to someone by another can produce a like emotional state, although not necessarily one that is identical in expression: Anger by another may produce not only fear in the target of the anger (as is usually thought), but also the action tendencies of oppositionality and recalcitrance in the perceiver. In this section, the article by Rieder and Cicchetti (1989) documents the importance of emotion contagion in child abuse and how such contagion affects control over aversive stimuli. Gottman and Fainsilber Katz (1989) also briefly discuss how anger in maritally unhappy couples can create anger contagion in the children of these couples.

Third, *hedonic stimulation,* such as sweet substances, painful stimuli, nonnutritive sucking, and soothing stimuli, can also generate powerful affective reactions in the child. Izard, Hembree, Dougherty, & Spizziri (1983) have shown how the predominant reaction of young infants to painful injections is distress, which eventually shifts to the goal-oriented state of anger by 19 months of age. R. Campos (1988) has in turn shown that nonnutritive sucking short-circuits most of the heart rate increase and crying that is induced by painful inoculations in newborns. (The importance of hedonic stimulation will be elaborated on later in a separate section.)

Fourth, *ecological factors* become crucial aspects of emotion generation and regulation. There are a number of ways by which ecological factors affect emotion. One is by the principle of *exposure* (Gordon, in press), that is, by whether the caregiver allows the child to encounter affect-eliciting circumstances. Some parents provide few opportunities for their children to see negative emotions like sadness or anger. They may also control the environment to minimize the likelihood that the child will experience unplesantness. In Japan, both types of exposure control occur with respect to the emotion of anger. There, the mother tries hard to avoid frustrating the child. The Japanese mother's value system is one of indulgence of the child, because her goal in socialization is to establish a sense of harmony in the family and not conflict (Miyake, Campos, Kagan, & Bradshaw, 1986). The Japanese infant is also shielded from anger signals: Anger is rarely expressed by the mother to her child, especially in public settings. When it is expressed, the child's reaction to the anger is far greater than that of children who are accustomed to such expressions (Miyake et al., 1986).

Furthermore, Japanese infants are rarely exposed to maternal separation. As a result, when Japanese infants are tested in the Ainsworth Strange Situation, with its repeated separations of the infant from the mother, the stress of the attachment test is far greater to the Japanese infant than it is for infants for whom separations and reunions with the mother are frequently encountered, such as those in northern Germany (Miyake, Chen, & Campos, 1985; Grossman, Grossman, Spangler, Suess, & Unzner, 1985).

Physical development also changes the child's ecology and, thus, can create new affect-eliciting encounters as well as increase their frequency. For instance, when infants begin to crawl, mothers in the midwestern United States report that they begin to react angrily to the baby when they attribute willfulness or responsibility to the baby (Bertenthal & Campos, in press). Moreover, because for the first time the infant can explore objects that are dangerous or delicate on his or her own, the locomotor infant creates opportunities for conflict with the parents. Thus, the acquisition of locomotion changes the affective environment of the child.

The child's ecology also includes the family's *emotional climate* (Zahn-Waxler & Kochanska, in press). The proportion of time that the child encounters laughter, fearfulness, anger, or

other emotions has major implications for the child's emotional development, even when the emotions are not directed at the child. By the principle of emotion contagion described above, persistent exposure to any emotion can eventually result in dispositions to react with like emotion. For instance, Zahn-Waxler and Kochanska speculate that an emotional climate typified by considerable blame and anger may be crucial in fostering a guilt-ridden personality in young children. In this issue, both Gottman and Fainsilber Katz and Rieder and Cicchetti document very well how the history of prior negative interactions affects both dispositions to play with other children and the deployment of attention.

The consequence of this new emphasis on emotion generation is an appreciation of the multiplicity of ways in which the emotional state of the other can be regulated by the environment. The caregiver need not merely await the emergence of cognitive skills to expect regulation of emotion; motivational, sensory, perceptual, and ecological processes can, under the right circumstances, produce desired emotional changes in the other and, under other circumstances, produce dysfunctional behavior (Rieder & Cicchetti, 1989).

2. **There is a new emphasis on the importance of action and action tendencies.**

If a major function of emotion is to change the relation between the organism and the environment, one must necessarily consider the various ways by which such changes in relations can be accomplished. By action and action tendencies, we do not necessarily mean responses with a distinctive morphological structure. Rather, *action tendencies* refers to the preparation to execute any of a number of rather morphologically different behaviors that, nevertheless, serve the same function with respect to the environment. Sroufe (1979) has been one of the most articulate proponents in developmental psychology of this viewpoint. As alluded to earlier, he stresses that the same physical act can have many different affective meanings and that many different physical acts can serve the same underlying function. Thus, action tendencies are flexible motor programs.

Research on action tendencies has been relatively scarce (Barrett & Campos, 1987). In recent months, however, there has been growing interest in the theory of dynamic action systems, whereby self-organizing principles of interaction of simpler systems combine to form more complex, apparently emergent, behavioral tendencies (Fogel & Thelen, 1987). Perhaps this new theory will provide the methodological and empirical foundation for the study of action in emotion-inducing contexts. Fogel and Thelen have already demonstrated the applicability of this approach to understanding the development of communicative actions.

Kopp's article in this section nicely represents this new stress on action. Throughout her article, the emphasis is on what the child does, rather than what he or she feels; the term *feeling* rarely appears. It is also significant that all three articles in this section in which neuroendocrinological measures are recorded (Fox, 1989; Gottman & Fainsilber Katz, 1989; Gunnar, Mangelsdorf, Larson, & Hertsgaard, 1989) emphasize the importance of action for an understanding of the role of both adrenocortical and adrenomedullary hormones. Although cortisol, epinephrine, and norepinephrine may accompany specific emotional states, such as fear of separation, they may be more closely related to the action tendencies that the organism is manifesting upon maternal departure. As Gottman and Fainsilber Katz note, several researchers working with adrenal hormones have speculated on the possible role of active and passive coping on hormonal patterning. Earlier, Mason (1975) and, more recently, Frijda (1986) have engaged in similar speculations. Indeed, Frijda (1986) explicitly proposed that "physiological response, autonomic arousal included, is part of [the] action readiness mode. It can be considered as offering logistic support for the actions that the readiness is readiness for; or . . . it embodies withdrawal of such logistic support" (pp. 173–174).

As has been mentioned before, the important new idea is that today there is less of an emphasis on the unifying role of a central feeling state and more of a realization of the importance of *what the organism is doing to adapt his or her goals to the environment and to modify the environments to fit those goals.* The implication of the emphasis on action for the caregiver–infant dyad is thus clear: Emotion regulation involves, at least in part, regulating the action tendencies of the other—facilitating action tendencies when desirable, redirecting them when necessary, or preventing them when culture or danger dictates.

3. **To understand emotion, one must understand that the human being lives in a web of interrelationships with social and physical objects.**

Today's research vocabulary reflects the social network in which we live. Consider terms like *intersubjectivity* (Trevarthen, 1984), *intersubjective self* (Stern, 1985), *affective attunement* (Stern, 1985), *we-go* (as opposed to *ego*) (Emde, 1988), *interfacing of minds* (Bretherton, 1985), *shared meaning* (Brenner & Mueller, 1982; Emde, 1988), *emotion sharing* (Dunn & Kendrick, 1982), and *empathy* (Eisenberg & Strayer, 1987). These and similar terms convey the sense that the emotion of the other can directly affect the self. This emerging realization has had profound consequences for our interest in, and understanding of, emotion regulation in infants, children, and adults.

A good illustration of the changes that have taken place in the conceptualization of emotion over the past 10 years concerns the increasing study of facial, vocal, and gestural signals as regulators of infant behavior in a variety of settings. In particular, there has been considerable interest in how emotional expressions affect the interactions of individuals toward objects (Klinnert, 1984), persons (Boccia & Campos, in press), and even the self (Emde, 1988; Klinnert, Campos, Sorce, Emde, & Svejda, 1983). Emotional signals, by communicating the value system of the caregiver, may also make possible the generation of emotions such as shame and guilt, which continue the process of emotion regulation at higher levels and at older ages than infancy (Barrett & Campos, 1987). Thus, social referencing illustrates how the child seeks meaning from the emotions of the caregiver as well as how distressing it is to the child to have significant others be emotionally unavailable (Sorce & Emde, 1981).

Another issue that social referencing raises is the question of when a child perceives an emotional signal to be authentic or not. Until now, most investigators have not considered whether the signal transmitted to the infant is perceived to be fake. Indeed, such perception of inauthenticity may account for some of the failures reported in the literature of a social referencing

effect (Klinnert, 1984). The work of Ekman, Levenson, and Friesen (1983) documents the morphological differences in facial expression between role-played smiles and authentic smiles. There is every reason to expect that similar morphological differences exist for other emotional signals as well and that, at some point in development, the infant or young child begins to pick up the difference.

The emphasis on the social interconnectedness of the human has led to the suggestion that the term *emotional expression* may be a misnomer (Hinde, 1985). The term is a legacy of the conception of feeling as the essence of emotion, with facial, vocal, and gestural movements being the outward signs of the internal essence. However, one can argue that the importance of "emotional expressions" does not arise from such movements being the outward manifestations of feelings. To date, no study has adequately demonstrated with appropriate converging operations that a particular configuration of face or voice represents the consistent manifestation of an internal state (Fridlund, in press). What cross-cultural studies have demonstrated is that actor-posed extreme facial or vocal patterns consistently produce the same or similar labels or attributions by judges from very different societies. Because facial and gestural movements convey such similar messages and because they have such powerful behavioral regulatory significance, we believe that Hinde was right in questioning the term *emotional expression,* and we propose that the term *emotional signal* is preferable. Certainly, the use of the latter term stresses the relational consequence of emotion in a manner that the former term does not.

There is no doubt that emotional signals are relational phenomena in their own right. That is, even when considered to be expressions, the facial and vocal movements are not just patterned into particular configurations. They are also targeted to environmental events or figures. In a recent study of the organization of facial movements and vocalizations in response to restraint, Stenberg and Campos (in press) demonstrated that at 4 and 7 months of age, infants undergoing arm restraint showed clear evidence of the theoretically predicted facial patterning of anger. Furthermore, in the course of their study, they also demonstrated that the anger-communicating movements were almost always directed. At 4 months, the infant directed the signals at the hands producing the restraint and (less frequently) at the person doing the frustrating; at 7 months, the infant looked at the mother while showing the anger face.

4. Autonomic responses are being reconceptualized as relational phenomena.

Autonomic responses are almost universally considered relatively involuntary and intrapersonal processes that are exclusively in the service of the internal economy of the organism during states of arousal or emotion. Cannon (1927), for instance, proposed that the function of autonomic changes was, among other things, to prepare the body for release of blood sugars, for blood clotting, for redistribution of blood to different organ systems, or for increased metabolism.

However, these intrapersonal functions may tell only part of the story. Autonomic reactions may also have subtle but powerful social regulatory consequences in their own right—regulatory consequences very much like those described above for facial, vocal, and gestural reactions. Perhaps the best example of an autonomically mediated reaction that has clear social communicative significance is blushing, a hallmark of embarrassment, shame, and other states of self-consciousness. People notice this vascular reaction and attribute to the blushing person a desire to avoid further attention. Facial flushing is another illustration of a socially communicative autonomically mediated response. It differs dramatically from blushing in that it involves not just the area around the ears and cheeks, but the whole face. Moreover, it communicates a very different emotional message—one of intense anger. Vascular processes also can communicate sexual emotion. Masters and Johnson (1966) describe how the upper-breast region flushes in direct relation to the intensity of sexual excitation. Indeed, autonomically mediated sexual responses not only demonstrate that autonomic responses can be patterned quite specifically in relation to what the person is striving to accomplish, but that they also have undeniable social communicative significance (as Eibl-Eibesfeldt, 1970, pointed out). Similar considerations can be made about the autonomic mediation of the retching of disgust, the pupillary dilation of surprise and fear (Hess, 1975), and the weeping of sadness. Each of these emotions has associated action tendencies that are both autonomically mediated and have social communicative significance.

Two of the articles in this special section (Fox, 1989; Gottman & Fainsilber Katz, 1989) stress the importance of vagal tone for the regulation of attention and the modulation of motoric activity. Both Fox and Gottman and Fainsilber Katz propose that vagal tone affects social interaction indirectly, either through the intermediary of temperamental inhibition (Fox), or through effects (of uncertain mechanism) on the parent–infant interaction (Gottman & Fainsilber Katz).

However, in line with the arguments made above about the social communicative significance of certain autonomically mediated responses, vagal processes may have much more direct social impact than is considered by the authors in either article. Both the vagus and the sympathetic nervous system influence the depth and the rate of respiration, which in turn affects vocal production. Such vocalizations may communicate quite directly the relaxation or tension that the autonomic nervous system is serving. Perhaps this is the mechanism by which the vagal tone factor described by Gottman and Fainsilber Katz affected the child's quality of play and interaction with the parents, a relation otherwise left unexplained by the authors.

In sum, the conceptualization of emotions as relational processes leads to very different views of the traditional response systems that are typically linked to emotion. It is interesting to speculate that the autonomically mediated responses are not just linked to the internal economy of the organism. Those autonomic responses that have social communicative significance clearly reveal undeniable evidence for the long-sought, but rarely found, specificity of emotional reaction (e.g., sexual displays for erotic emotions, tears for sadness, reverse peristalsis for disgust or distaste, vocal tension for fear, etc.).

5. Hedonic stimulation acquires new importance.

One of the most significant implications of the contemporary conceptualization of emotion has been the rebirth of interest in the processes of pain, soothing, and pleasure. This rebirth of interest is beginning to have important social policy implications in neonatology, anesthesiology, and behavioral pediatrics. These implications follow from the increasing challenges to the

performance of painful medical and nursing procedures, such as circumcision, blood-drawing, and injections, without appropriate behavioral or pharmacological pain-management interventions.

The cognitive view of emotional development proposed that newborns could not "experience" pain or pleasure because they lacked the cognitive prerequisites for such emotional experience. Sroufe, writing as late as 1979, dismissed the psychological significance of pain and pleasure in early development, attributing the newborn infant's distress to purely "physiological" processes. Earlier, Spitz (1965) had described the newborn's emotional state as one of "excitement, tinged with unpleasure." The disregard of the possibility of newborn experience of infant pain was at one time as prevalent as the view that the newborn was blind or deaf.

These views are now being challenged, and the crucial role of hedonic processes in the overall emotion regulation of the infant is beginning to be documented (La Gasse, Gruber, & Lipsitt, in press). The physiological and behavioral picture of the newborn's response to pain is one that is consistent with active coping with trauma. For example, in response to various types of painful stimulation such as circumcision, newborns show heart rate changes of 40% above resting levels, marked increases in serum cortisol, and elevations in intracranial and arterial blood pressure. Moreover, consistent with the relational view of emotions that we are articulating in this article, infants show the facial signals and instrumental (action tendency) manifestations of a pain-state. They show reduced periods of alertness, increased irritability, jerky motor movements, withdrawal from social interactions, and decreased ability to self-soothe (R. Campos, 1987, 1988). Most intriguing of all is the recent observation by Franck (1986) that babies actively swipe at the source of the pain with the unaffected leg, even in the newborn period. If Franck's observations are confirmed, they will indicate that even neonatal behaviors are goal-directed!

The realization that infant pain is psychologically real and does not await the development of cognition to achieve psychological significance has in turn led to the exploration of behavioral interventions for soothing pain-elicited distress. A number of studies have provided the basis for four important principles about soothing (R. Campos, 1988). (a) In general, the more constant the stimulation, and the more the sources of unvarying stimulation, the greater the soothing effect. (b) Oral, tactile, and vestibular stimulation seem prepotent in soothing infants. (c) If an infant is given a source of stimulation on which to focus, the resulting activation of one sensory stimulus can impede the noxious effects of pain. (d) Arousal transfer (Zillman, 1971) appears to play an important role in the magnitude of reactions to pain and soothing. *Arousal transfer* refers to the process whereby energy mobilization resulting from one environmental encounter interacts additively or multiplicatively with arousal produced by a second environmental encounter to increase the levels of energy expenditure. Thus, a child in a background state of high arousal resulting from hunger or thirst may have a more intense reaction to painful stimulation than a child who is in a lower state of arousal to begin with. Thus, one implication of the arousal transfer notion for the regulation of infant behavior to painful stimulation may be to administer the medically necessitated painful procedure when the infant is not too aroused.

One of the implications of hedonic stimulation and soothing for emotional regulation is that infants can be actively involved in regulating their own levels of arousal and that caregivers can use general principles of behavior management to help the infant cope with high levels of distress. Clearly, to judge from the few studies in the literature on this important topic, previous working definitions of emotion and emotion regulation have not drawn our attention to this important topic of investigation, nor have we recognized how crucial it is to consider that emotion regulation begins in the neonatal period and even before (see Kopp, 1989). Moreover, by modulating the infant's level of distress, the caregiver simultaneously modulates his or her own level of distress as well. Even in the area of hedonic stimulation, then, emotion is intrinsically relational and not solely intrapersonal.

Emotion, Temperament, and Developmental Continuities

No contemporary treatment of emotion would be complete without discussion of some of the major links between emotions and temperament in development. Several investigators (e.g., Emde, 1983; Campos et al., 1983; Izard & Malatesta, 1987) have speculated that emotion provides the core of continuity in the development of the self throughout the life span. One way in which emotion does so is through specific temperamental dispositions, by which we mean the characteristic individual differences in the intensive and temporal parameters of expression of emotionality and arousal, especially as these differences influence the organization of intrapersonal and interpersonal processes (Campos et al., 1983; Goldsmith & Campos, 1982).

When temperament is conceptualized in this way, two domains of individual differences in emotional reactivity show impressive levels of continuity. Two of the articles in this special section also document impressive levels of stability of temperamental disposition (Fox, 1989; Gunnar et al., 1989).

One domain that shows stability over long periods of time is *irritability*. Korner, Hutchinson, Koperski, Kraemer, & Schneider (1981) found high day-to-day stability of irritability that was unaffected by birth circumstances. Birns, Barten, and Bridger (1969) reported stability between neonatal irritability and irritability 4 months later. Studying Japanese infants, Miyake et al. (1985) reported that infants who showed low thresholds to elicitation of crying in response to removal of a nipple also showed low thresholds to crying in general and were more likely to be classified as "C" infants in the Ainsworth Strange Situation 1 year later. Most recently, Riese (1987) and Matheny, Riese, and Wilson (1985) demonstrated significant relations between neonatal measures of irritability and measures of emotional tone, attentiveness, activity, and social orientation at 9 months of age; when tested at 24 months of age, irritable neonates were found to be more upset, less attentive, and less sociable. Fox's (1989) study also reports that infant reactivity to arm restraint is related to the newborn's reaction to removal of a nipple. He reports that 10 of the 17 infants who did not cry upon moderate restraint also did not cry upon pacifier withdrawal in the newborn period. In the same study, he reports results consistent with Miyake et al. (1985), noting that infants who cried upon pacifier withdrawal showed shorter latencies to

cry upon maternal separation at 14 months. The Gunnar et al. (1989) study also shows strong relations between emotional reactivity at 9 months of age and similar measurements taken at 13 months. The study also shows relations between proneness to distress and adrenocortical assessments. When these studies are placed in the context of the early findings by Bell, Weller, and Waldrop (1971) showing continuity between neonatal irritability and preschool behavior, the conclusion is clear that irritability and negative emotionality show impressive continuity throughout infancy and early childhood.

The second impressive set of findings on the continuity of temperamental dispositions concerns the Harvard longitudinal studies on temperamental inhibition (Kagan, Reznick, & Snidman, 1988). These studies have reported that infants who were selected at 21 months to fall in the upper and lower 15% of a distribution of scores on wariness to unfamiliar situations, inhibition in social interactions, and inhibition of play were also inhibited, quiet, and timid at 7 years of age. These findings have been obtained in three cohorts, and, occasionally, it has been found that inhibited infants show high and stable heart rates, whereas uninhibited infants show low and variable heart rates. The latter pattern suggests that vagal tone may be an important physiological correlate, and possibly a determinant, of low inhibition and high sociability. The correlation between assessments of vagal tone and sociability initially reported by Kagan et al. is supported by the findings of Fox's (1989) study. Moreover, Fox's study extends downward, to 5 and 14 months, the ages at which stability is shown between vagal tone assessments and sociability. Thus, temperamental inhibition is a second emotional disposition to show impressive levels of continuity.

Conclusion

We agree with Dodge (1989) that a complete perspective of the process of emotion regulation requires understanding from multiple response systems, including cognitive, motoric, and neurophysiological functioning. We have, however, tried to go beyond the authors of the five articles that constitute this special section by enriching the conceptualization of emotion and emotion regulation. Our view differs from that of many others in stressing that emotional response systems do not merely interact. Thus, studying each system in isolation does not illuminate very much about the nature of emotion. Rather, we stress emotion as a single relational process with many facets that act in concert. For example, elicitation of fear is not separable from the organism's appreciation of the fearful stimulus and his or her potential for coping with it.

Consequently, our reconceptualization has focused on how emotions are elicited, the functions of emotion in the adaptation to the social world, and emotions as the basis for enduring personality dispositions. By taking this orientation, person/environment transactions, rather than cognitive prerequisites, become the center for studying the development of emotion regulation. We have reviewed three processes that are central for making an event significant to the human: the relevance of an event to the goals and strivings of the person, emotional communications from significant others, and hedonic stimuli. We have discussed examples of how the ecology of the family environment determines the exposure of the developing child to emotion signals.

Finally, we have also examined the caregiver's impact on the self-regulating action tendencies of the infant, with emphasis given to principles for modulating the infant's response to negative hedonic stimuli. The caregiver's role in modulating levels of arousal is viewed as especially important in light of the stabilities of individual differences in emotional reactivity. The possibility that autonomic reactions also have powerful direct and indirect social communicative consequences suggests that infant–caregiver influences should be reexamined in light of the new insights provided by a relational perspective on emotion.

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