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Interpersonal Responding to Discrete Emotions: A Functionalist Approach to the Development of Affect Specificity

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Abstract

To date, emotion research has primarily focused on the experience and display of the emoter. However, of equal, if not more, importance is how such displays impact and guide the behavior of an observer. We incorporate a functionalist framework of emotion to examine the development of differential responding to discrete emotion, theorize on what may facilitate its development, and hypothesize the functions that may underlie such behavioral responses. Although our review is focused primarily on development, the theoretical and methodological ideas laid out are relevant for researchers of emotion at all ages.

Keywords
affect specificity, emotion, functionalist theory of emotion, social signaling

Emotion is a dynamic and reciprocal interaction; a psychological bridge connecting the goals of one person with the goals of another. While researchers of emotion have long sought to study the experience of the person on the emoting side of this interpersonal bridge, a chasm exists in our understanding of how emotion communication is responded to. This article attempts to highlight this gap and begin building the bridge between communicator and receiver.

Crucial for emotion understanding is the individual's capability to *appreciate* and *use* the emotional communication of others to regulate their behavior and the behavior of others. In order for one to engage with and respond to an increasingly complex social world, one must discriminate the quality of the specific emotion being communicated (i.e., affect specificity) and respond with behaviors appropriate and adaptive to that specific emotion given the context (what we term *functional affective responding*). Providing care to an angry enemy is just as inappropriate as recoiling in horror at a friend's sadness. The development of functional affective responding to discrete negative emotions is essential if the individual is to take part in a relational world. This important skill is the basis of this article.

To illustrate the importance of this phenomenon for theoretical and empirical research, we begin by emphasizing a functionalist framework for the study of differential discrimination and responding to discrete emotions. We then provide an overview of studies investigating the development of infant discrimination of emotion valence and discrete negative emotions. Next, we review the few studies that have contrasted infant behavioral responding to discrete negative emotions. We then use this review to propose some factors that may account for and facilitate the development of functional affect responding. We go on to propose the functions of behaviors we believe should be evident by infants' responding to discrete emotions. This will include providing examples from various studies that demonstrate the types of differentiated behaviors researchers have described in infancy and early childhood. Finally, we lay out some considerations and suggestions for future studies of differential responding to distinct negative emotions. Although much of the work reviewed in the following pages is rooted in developmental research, the principles highlighted are relevant to all investigators in the field of emotion.

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The Development of Differential Responding to Discrete Emotions from a Functionalist Perspective

Prior research conceptualizing and investigating affect specificity has examined the observer of emotion displays as a passive spectator of social signals. For example, Walker-Andrews (1997) defines three sequential developmental abilities for affect specificity: *detection* (i.e., sensitivity and responsivity to information), *discrimination* (i.e., ability to distinguish the difference between two objects or events), and *recognition* (i.e., interpretation of how the emoter is likely to behave based on the communicated information). However, these terms fall short in capturing the important role of emotions as behavior regulators in social interactions (for a review of this idea, see Campos, Thein, & Owen, 2003). We propose the need for an additional term deserving of conceptual and empirical inquiry: *functional affective responding*. Functional affective responding refers to *the observer's use of emotion information to coordinate responses relevant to his or her goals, which may or may not be related to the goals of the emoter*. We use the word functional to denote responses related to a person's active attempt to establish, change, or maintain their relation with the environment on matters of significance.

A functionalist view of emotion emphasizes how emotions impact and regulate the relations between the individual and the context the individual perceives (for a review, see Saarni, Mumme, & Campos, 1998). Although emotions may consist of feeling states and affective displays, the functions that these components serve as motivators and communicators in a relational environment are seen as criterial for understanding emotion and emotion development. From a functionalist perspective, what is of interest is not to realize that an individual may be sobbing, but rather to understand the *function* and *communicative value* of the individual's sobbing in relation to the individual's goals. Likewise, it is not of interest that a bystander labels the sobbing individual as sad, but rather how the bystander *responds* to the sobbing individual and the effectiveness of the bystander's response in relation to the bystander's own goals. Translating these principles into research, investigators may infer the relational goals of the individual by studying the functional relevance of the observed behavior. We believe that a full understanding of emotional development requires discovering when infants respond to discrete displays of emotion with functionally differentiated behaviors and what forms these behaviors take in their manifestation. Such differential responding is likely to be preceded by infants' ability to discriminate qualitative differences in emotion displays.

The Development of Discrimination of Emotion

Infant discrimination of negative versus non-negative emotions. Research using looking time and habituation paradigms has found that infants are able to discriminate two displays that differ in valence when the emotions are communicated multimodally using the face and voice at 4 months (Flom & Bahrick, 2007; Montague & Walker-Andrews, 2001), vocally at 5 months (Fernald, 1993; Flom & Bahrick, 2007; Walker-Andrews & Grolnick, 1983; Walker-Andrews & Lennon, 1991), and facially at 7 months of age (Flom & Bahrick, 2007; Kestenbaum & Nelson, 1990). However, these studies do not confirm that the basis for the discrimination is the different valence of the displays. More conclusive evidence is provided by infants' distinct behavioral responses to negative and non-negative emotions (e.g., playing more with a neutrally or positively valenced toy and less with a negatively valenced toy) when messages are communicated unimodally or multimodally between 9 and 12 months of age (e.g., Hertenstein & Campos, 2001; Klinnert, 1984; Walden & Ogan, 1988).

Infant discrimination of discrete negative emotions. Although extensive work has traced the development of infants' ability to discern a neutral or positive display from a single negative display (e.g., fear), fewer studies have investigated infants' ability to respond differentially to discrete negative emotions. This is an important line of inquiry because the social world cannot be functionally categorized by valence; doing so would result in impoverished, over-generalized, and inappropriate responses to the myriad emotions one encounters in social interactions. Rather, one must respond to specific emotions with specific behaviors appropriate to the particular social context.

Habituation and looking time studies have reported discrimination of one negative emotion from another when the displays are presented multimodally through the face and voice by the age of 4 months (Flom & Bahrick, 2007). Infants are able to differentiate unimodal auditory displays of anger and sadness by 5 to 7 months (Flom & Bahrick, 2007; Walker-Andrews & Lennon, 1991), and unimodal facial displays of anger and sadness by 7 months (Flom & Bahrick, 2007). As noted before, this discrimination may not be mediated by different affective qualities, but perhaps by separate non-affective features.

Although studies investigating infant detection and discrimination of emotion communication are relevant to a description of development, they do little to further our understanding of how infants navigate increasingly complex social settings. Of greater interest is how infants respond to discrete emotions in interactive contexts. In a more interactive study, Montague and Walker-Andrews (2001) had an adult engage 4-month-old infants in a peek-a-boo game and intermittently display happiness, sadness, anger, or fear. The researchers found decreased infant looking to sadness and increased looking to fear and anger displays, possibly demonstrating that infants looked away from the sad adult so as not to draw attention to the adult, whereas in the fear and anger conditions infants increased in looking to the adult as a result of heightened vigilance to the situation. However, because the study did not afford infants the freedom to respond instrumentally to the qualitative difference in the negative emotions (a limitation the authors themselves acknowledge), this interpretation is only speculative.

Shortcomings and pitfalls of the above studies. Although the research reviewed above contributes to our understanding of the development of infant *discrimination* of discrete emotion displays, it falls short in demonstrating whether infants *appreciate* and *utilize* the differences in each display to functionally respond to discrete emotions. It is insufficient for the infant to merely notice differences inherent to the display (e.g., facial configuration; vocalic dynamics). Rather, the infant must adapt his or her response to the emotion based on the *meaning* of the emotion. For instance, if one showed infants the words "coat" and "boat" and found that infants could tell the two tokens apart, one would not conclude that infants appreciated the difference in meaning between the two words, much less be able to act on the discriminatory capability, such as understanding that a coat keeps one dry from rain and a boat keeps one afloat on water. Passive contexts in which the infant merely looks toward an adult say little as to how the infant *uses* discriminatory capabilities in social interactions.

In studies of emotion, the empirical question of interest concerns one's appreciation and utilization of that which is communicated. From a Darwinian perspective, emotion displays signal to the observer what actions are likely or unlikely to follow from the emoter (for a review, see Parkinson, 2005). Based on this forecasted action-consequence prediction, the observer may modify his or her behavior to adapt to the changing context. In order to understand the functional consequences of infants' developing affective specificity, research is needed that presents emotions in contexts where goal-oriented behavioral responding may occur.

Studies Using Instrumental Behavioral Measures in the Study of Affect Specificity

Studies investigating infant response to multiple discrete negative emotions are limited, but a handful of studies do exist in the developmental literature to help shed light on the emergence of affect specificity in infant behavioral responding. Sorce, Emde, Campos, and Klinnert (1985) conducted one of the earliest studies on the topic of affect specificity with 12-month-olds on a visual cliff. Mothers displayed fear, anger, interest, sadness, or happiness when infants reached the edge of a perceived drop-off. Infants in the happiness and interest conditions crossed on the majority of trials, while infants in the fear and anger conditions rarely did so. Interestingly, infants in the sadness condition crossed one-third of the time and displayed more referencing to parents than in any of the other conditions. This may indicate that infants were confused by or unsure of the mother's sadness display. Sensitivity to the contextual appropriateness of an emotional display may be a level of discrimination of affect that develops between perceptual discrimination and differentiated behavioral responding. Although the visual cliff is an established paradigm that reliably elicits social referencing and use of the emotion displays of another to disambiguate the context, it is limited in the behavioral responses with which the infant may respond (crossing or not crossing the cliff). If researchers wish to investigate differential responses by the infant to discrete emotions, the infant must be allowed flexibility to respond in a variety of ways.

One example of providing such behavioral flexibility can be found in Denham's (1986) naturalistic observation of 2- to 3-year-olds' responses to peers' displays of joy, sadness, anger, and distress. Children were found to respond differentially to peers' negative emotions with a number of distinct behaviors. Children responded to anger displays most often by matching peers' emotion, ignoring the peer, leaving the area, and displaying few prosocial behaviors. Children responded to sadness displays by ignoring the peer and engaging in few prosocial behaviors, but infrequently left the area. Finally, children responded to hurt displays with increased prosocial behaviors and looks of concern. The differences in children's responses to sadness and hurt displays are particularly intriguing, potentially indicating that children understand how to respond to physical (hurt), but not psychological (sadness) distress, or that the observed response to others' sadness indicates an attempt to decrease attention to the sad individual, but not abandon the sad individual (an idea we expand upon later). Although this study was unable to control for intensity and referential specificity (i.e., that the observer understood the specific referent of the communication) of peers' emotion displays, it has high ecological validity and afforded children a wide range of possible ways to respond.

A laboratory study that attempted to provide increased behavioral affordances to the infant while maintaining a degree of experimental control was reported in Campos et al. (2003). In this study, parents displayed an emotion toward a novel toy to which infants were free to respond. However, findings from this study failed to demonstrate discernible differences between 8½- and 11-month-old infants' responses to the mother's anger and fear expressions directed toward the toy, with both expressions eliciting increased referencing to the mother and inhibited infant exploration of the toy in comparison with joy. In a related study from the same report, 15-month-old infants' responses to mothers' disgust or anger also failed to elicit differential responding of approach and avoidance in relation to a novel object.

Another attempt to find differential responding to different negative emotions by infants was carried out by Bingham, Campos, and Emde (1987). In this study, 13- and 15-month-old infants "broke" a toy doll. Subsequently, an experimenter expressed fear, sadness, surprise, joy, disgust, or anger. It should be noted that in this study each of the adult's emotions could be a contextually appropriate response to the child breaking the doll. Consistent with the report by Campos et al. (2003), infants did not respond differentially to discrete negative emotions and only showed a difference in responding based on the valence of the emotion—playing with the doll less in negative emotion conditions than in the positive condition. However, it should again be noted that a behavioral response of avoiding the doll is not entirely surprising in light of the observations by Denham (1986), who reported similar findings to fear and anger displays among older infants. Furthermore, infant avoidance of the doll in response to adult negative emotion fails to describe variations in infant instrumental behaviors, social referencing, and displays of emotion that also may have taken place.

More controlled experimental contexts for the study of affect specificity have been carried out using a television and either food or a toy being presented to the infant with an accompanying emotional display. Gendler-Martin, Witherington, and Edwards (2008) showed infants a videotaped actress who expressed either a neutral, fearful, or sad display toward a target toy, which was then presented to infants along with a distracter toy. Researchers found that 16- to 19-month-old infants, but not 12- to 14-month-old infants, differed in their responding to the toys in the fearful and sad conditions. Older infants played less with the target toy and more with the distracter toy in the fear condition, whereas infants in the sadness condition did not play differently with the toys, but displayed more negative emotion than infants in the fear condition. Infants in the sadness condition also played more with the target toy than infants in the fear condition, but less than infants in the neutral condition, indicating that the sadness expression had some regulatory effect on behavior, but not to the same extent as fear. Although these findings were significant only prior to corrections for error experiment-wise, they suggest that infants may differentially respond to negative emotions around 16 months of age.

Anderson (1994) used a similar paradigm to that of Gendler-Martin et al. (2008) and found that 18-month-old infants were more likely to offer food to an adult following a sadness display than to an adult who had displayed happiness, anger, disgust, or fear. Findings from the sadness conditions in these two studies are similar to those reported by Zahn-Waxler and colleagues (for a review, see Zahn-Waxler & Smith, 1992), where infants as young as 15 months have been found to display more empathic concern, such as the negative affect reported by Gendler-Martin et al. (2008), and prosocial responding, such as the food offering reported by Anderson (1994), when an adult is sad or distressed.

A discerning reader may think of three studies not mentioned that on the face of it demonstrate differential responding to discrete emotions. The first is the neonatal imitation work by Field, Woodson, Greenberg, and Cohen (1982) that reported neonatal discrimination and imitation of affective displays, thus implying that newborns react with different expressive reactions to different displays of negative emotion. The second study is by Haviland and Lelwica (1987) that found differences in 10-week-old infants' facial responses to parents' joy, anger, and sadness displays. The third study is by Miyake, Campos, Kagan, and Bradshaw (1986) that found Japanese infants responded differently to anger versus fear displays, though American infants' responses were undifferentiated.

We do not believe these three studies contradict our view of differential affective responding. None of these studies reported differential goal-directed responses to the different negative emotion displays. Furthermore, the Field et al. (1982) study has failed to replicate (Kaitz, Meschulach-Sarfaty, Auerbach, & Eidelman, 1988), and Haviland and Lelwica's (1986) work has not been confirmed after nearly a quarter of a century. Finally, Miyake et al. (1986) themselves interpreted the different responses to anger and fear by the Japanese infants on the basis of discrepancy: Japanese infants are rarely exposed to anger, making such displays more arousing than other displays.

From our review, it appears that the development of differential behavioral responding to discrete emotions has received little attention in research, and what studies have been done reveal little evidence for differential functional affective responding before 15- to 18-months of age. The above studies represent the beginning of an investigative frontier, which is as rugged in its methodology and measurement as the frontier facing any pioneer. In much the same way that empirical research has found infant discriminatory ability of emotion to progress from relying on the presence of multimodal cues to later only needing more subtle cues, such as the face or voice alone, we propose a similar expectation for infant development of differential functional responding. Null results from the above studies should serve as fuel, not wet blankets, for the study of this important topic. At some point in development the human infant gains the ability to respond differentially to discrete emotions. Researchers are only beginning to scratch the surface of this phenomenon, and no conclusive findings have yet to discern at what age infants respond differentially to discrete emotions. However, based on the literature reviewed above, we believe this capability can be expected to become evident in the second year of life.

Factors that May Facilitate the Development of Functional Affective Responding to Discrete Emotions

Having described the dearth of empirical and theoretical research on the development of infant functional responding to discrete displays of emotion, we now turn to the open space of hypothesizing what specific factors may facilitate the acquisition of such behaviors. We believe the developmental unfolding of functional affect responding is likely to unfurl with the infant first discriminating different emotion displays from one another. Such discrimination should lead to the infant connecting specific displays with specific behaviors of the emoter, and thereby help the infant predict what behavior is likely to follow an emoter's display. Finally, the infant should use this predictive capability to coordinate a behavioral response to the emotion display based on what the child predicts the emoter's proceeding response will be. It is possible, even likely, that differential responses to some discrete emotions may be present earlier than others, as has been found in preschoolers' categorization of emotion (e.g., Widen & Russell, 2010; although differential responding and categorization should not necessarily be assumed to develop with the same trajectory or sequence). While such a progression in emotional development is plausible, the mechanisms driving its development are likely to be many. In an effort to understand the developing infant, we highlight some related areas of development that may facilitate the emergence of functional affect responding.

Exposure to Discrete Emotions

Experience of observing an emotion is likely to affect one's detection, discrimination, recognition, and response to that emotion. Studies using habituation paradigms to investigate infant discrimination of emotion commonly report the presence of ordering effects (for a comprehensive review, see Walker-Andrews, 1997), which some researchers have taken to indicate that infant exposure to different emotions facilitates infant discrimination of those emotions (Ludemann & Nelson, 1988). Research by Pollak and colleagues may relate to this conclusion, finding that children who are regularly exposed to anger in the home (e.g., domestic violence, child abuse) identify anger faces more quickly and with fewer physiological cues present than children with less severe or no family abuse (Pollak, Messner, Kistler, & Cohn, 2009). As outlined above, discriminatory ability of emotion is necessary for behavioral responding to occur, and we speculate that functional affective responding is also likely to be impacted by the degree of exposure to negative emotions. In an experimental study, Repacholi, Meltzoff, and Olsen (2008) found that 18-month-old infants who witnessed an adult reprimanding another adult for an act were less likely to imitate the act when the reprimander was monitoring the infant than when the reprimander could not see the infant. These findings demonstrate that by 18 months of age infants are able to predict the emotions of another individual based on a previously observed event and regulate their behavior accordingly. Naturalistic observations by Cummings, Zahn-Waxler, and Radke-Yarrow (1981) reached a similar conclusion, finding that infants who frequently witnessed inter-parent disputes were more likely to respond with "complex patterns of responses involving several serial attempts at coping" (p. 1279). The above research suggests that infants use prior experience to actively deploy differentiated behavioral responses based on the perceived effectiveness of the response in the specific situation.

Locomotor Experience

One milestone in development that increases both infant exposure to emotion-laden interactions and infant flexibility for behavioral responding is the onset of self-produced locomotion. The acquisition of self-produced locomotion allows the infant to actively and independently explore the environment and corresponds with an affective restructuring within the infant–caregiver dyad (Biringen, Emde, Campos, & Appelbaum, 1995). Green, Gustafson, and West (1980) found that crawling infants accounted for nearly all reported parent–child conflicts involving "unpermitted activities" at 8 months of age. A similar increase in negatively valenced social interactions is evident following the onset of upright locomotion (walking), which affords the infant even greater physical and social opportunities. Walking infants prompt and receive more negative emotion from others, particularly their parents, as well as display more negative emotion, than crawling infants (Biringen et al., 1995). In addition to this increase in emotional, particularly negatively valenced, interactions, walking allows the infant greater behavioral and motoric flexibility for responding to the environment. This increased repertoire of behavioral responses may permit the infant to try new and different ways of responding to various emotions. Whereas a pre-locomotor infant may be limited to crying in distress when confronted with a scary stimulus, a walking infant may exhibit rapid seeking of parental security, or demonstrate more flexible approach behaviors to the stimulus and attempt to remove it with the limbs that are now motorically available. We believe locomotor experience promotes both an environment of increased exposure to emotional displays and greater behavioral flexibility for the infant to respond to this environment. This combination may help facilitate social and emotional development, particularly functional affect responding.

Development of Social-Cognitive Skills

Social and cognitive development work in tandem to promote the ongoing development of one another. Denham (1986) found that individual differences in 2- to 3-year-olds' responding to the emotions of others correlated with children's affective understanding, emotion identification, and perspective taking abilities. Perspective taking and theory of mind help an observer understand the relationship of the referent with the emoter and the relationship of the referent and the emoter with the self, and thereby coordinate a response to the perceived context. Infant perspective taking, theory of mind, and understanding of person–object relationships develop markedly in the second year of life (for a review, see Flavell, 1999). For example, 18-month-old, but not 14-month-old, infants will give an experimenter a food that the experimenter expressed pleasure towards, even when the experimenter's food preference differs from that of the infant's (Repacholi & Gopnik, 1997). Similarly, 18- to 20-month-old infants who observe an adult's distress are more likely to engage in behaviors specifically targeted to alleviate the adult's distress (e.g., giving the adult the adult's favorite toy, bringing a blanket to a shivering adult), whereas younger infants will not (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Thus, one would expect that the cognitive advances taking place in the second year of life are intimately related to the social and emotional development coinciding at this point in development, and vice versa. However, few studies of socio-emotional or cognitive development incorporate such cross-discipline approaches. Empirical investigations approaching cognitive and social development jointly are likely to yield the most fruitful findings when cognitive skills are investigated for their functional utility in meaningful contexts, such as social interactions.

Social Communication of Emotion Responses

While research on emotion socialization has mainly focused on how one experiences and expresses emotion, far less research has examined differences in how one responds to emotion. Russell (1989) likens emotions to relational "scripts" that characterize each emotion, and these scripts are highly influenced by

socialization and experience. From an early age, parents communicate information about emotion to their infants, both directly and indirectly. Hornik and Gunnar (1988) found that mothers interacting with 12- and 18-month-old infants in a social referencing paradigm were more likely to provide instrumental messages (i.e., how to act, what to do) than affective messages (i.e., how to feel) when talking to their infants, with affective information being primarily communicated through facial display and vocal tone. Although such direct tutelage is likely to take place during the second year of life as infants engage in more emotion eliciting situations and gain increased linguistic understanding (for research on early parent–child discussion of emotion, see Beeghly, Bretherton, & Mervis, 1986; Lagatutta & Wellman, 2002), less explicit transmission of emotion information likely occurs throughout infancy. For example, Malatesta and Haviland (1982) found that parents responded to 3-month-old infants predominantly with differential, rather than imitative, facial affect to infant emotions, possibly communicating subtle contingency patterns to discrete emotions. Infant understanding of, and response to, emotion is dependent on all previous experience with emotions (Saarni, 2008) and it is important for researchers to understand both the explicit and implicit emotion-related experiences of children in order to appreciate their emotional understanding and responses. Just as research has found cross-cultural differences in emotion expression (e.g., Camras, Bakeman, Chen, Norris, & Cain, 2006; Tsai, Levenson, & McCoy, 2006) and experience (e.g., Scollon, Diener, Oishi, & Biswas-Diener, 2004), such differences may also exist in relation to responses to discrete emotions. For instance, one could predict that people from Western cultures may be more likely to approach a sad individual to alleviate his or her distress, whereas people from Eastern cultures may avoid placing attention on the sad individual. Such investigations would complement the existing literature on cross-cultural differences in emotion expression and regulation and help complete our understanding of the bidirectionality of interpersonal interactions.

Predicted Functional Affective Responses to Discrete Negative Emotion Displays

It is clear that the developmental literature does not yet hold definitive evidence for when differential functional affective responding is evident, nor the particular ways in which this responding is manifested. Utilizing a functionalist perspective of emotion, we now propose the underlying goals of differentiated behavioral responses to four negative emotions. Although we will attempt to base the proposed function of each emotion response on the available literature, it should be evident from the above review that what follows necessitates some speculation. Also, the responses we outline below should be viewed in the context of the child as an observer of another's emotion display that is directed at a third object or event; the child is not the target of the emotion. For instance, responding to someone who is angry/fearful/disgusted with an *object* is much different from someone who is angry/fearful/disgusted with *you* (see Strayer, 1980; Zahn-Waxler et al., 1992). Additionally, it is important that the reader keep in mind that although we list an underlying *function* for each behavioral response, the behavioral manifestations of these *responses* may take any number of forms for a given emotion, or the same forms for different emotions (for an excellent review on this topic, see Sroufe & Waters, 1977). We do not propose that an individual's response to another's discrete emotion will always serve the same function; rather, there may be multiple functional responses for each discrete emotion, and each functional response may have an extraordinarily high number of ways it may be manifested. In the subsequent section we attempt to delineate the functional responses for four discrete negative emotions: fear, anger, sadness, and disgust.

Fear

The functional response to others' fear displays is to increase attention to the environment and often seek security. In many studies in which a fear display is presented toward a stimulus, children demonstrate increased attempts to locate and attend to the referent of the emotional communication, typically by referencing the individual communicating the fear (see Campos et al., 2003; Saarni, Campos, Camras, & Witherington, 2006). This is likely to ensure accurate referential specificity of the feared stimulus, as well as gauge the behavioral response of the emoter. In most cases, one is likely to coordinate this increase in attention with an attempt to avoid the stimulus (e.g., a novel toy, the drop-off on the visual cliff) and seek out security when it is available (e.g., closer proximity to a caregiver).

In empirical studies involving infant response to fear it is important to differentiate between the infant avoiding a toy and the infant actively seeking the parent as a source of security. For example, Klinnert (1984) found that 12- and 18-month-old infants moved closer to the mother when she displayed fear toward novel toys. More descriptive coding of the child's behavior (e.g., moving behind the parent, peering around the parent) would help researchers more accurately understand the function of the infant's behavior in such situations. Behavioral responses of stimulus avoidance in coordination with caregiver proximity seeking may indicate differential responding to fear and disgust.

Anger

When confronted with a display of anger, an individual is likely to engage in self-preservation responses with the goal of avoiding becoming the target of the anger display. However, this goal may be achieved in different ways. An individual may retreat, socially or physically, from the emoter so as not to draw attention to the self and thereby incur the wrath of the other. In a naturalistic study by Camras (1977), a kindergartner was given a desirable object—a caged gerbil—in view of a peer onlooker. The peer onlooker could then attempt to get the gerbil from the first child. Findings indicated that when an onlooker's attempt to take the gerbil from the peer was met with aggression/anger, the onlooker hesitated longer before re-attempting to take the gerbil than when the peer did not display aggression/anger.

Strayer (1980) observed a similar result, finding that 5-year-olds were less likely to respond to an angry peer than a peer who was happy, sad, or hurt.

Conversely, the observer may join the emoter in anger toward the referent in a cooperative effort, similar to empathic anger, where the observer becomes angry with the unjust anger-inducing culprit (as described by Hoffman, 2000). However, such cooperation may be distinct from Hoffman's empathic anger, in that the goal of engaging with the angry individual is fueled by a desire to become associated with the dominant person/group and thereby lower the potential for the emoter's anger to be redirected toward the self.

A third functional response to communicated anger is to assert dominance in the social setting and neutralize the anger situation by directing an authoritarian response, such as disciplining or intimidating, toward the angry individual. Observations of infants' responses to others' anger interactions in which the infant was a bystander have found that these exchanges sometimes elicit behaviors of scolding and punishing (Cummings et al., 1981; Dunn & Munn, 1985).

The flexibility with which infants actively deploy differentiated behavioral responses to specific instances of observed anger displays, as reported by Cummings et al. (1981), underscores the importance of coding the function of infant responses to negative emotions and accounts for equipotentiality of responding (a topic we highlight in a subsequent section).

Sadness

Upon witnessing another person's display of sadness, an individual typically attempts to alleviate the distress of that person. We believe these attempts are made in order to increase social connectedness with the emoter or other observers (although in a minority of cases one's goal may be to relieve one's own empathic distress; see Hoffman, 2000). Efforts to alleviate the distress of another may be demonstrated by either approach or avoidant behaviors. For example, upon learning that a friend's parent has passed away, one may engage the sad friend by providing a shoulder to cry on and prompting discussions of the friend's feelings or memories of the lost parent. Conversely, one may disengage from the individual and provide "space" for the grieving process to take place. However, what unites the various, and at times opposing, behaviors is their shared goal to alleviate the distress of the sad individual.

Research investigating the development of empathic responding found that 15-month-old infants respond to parents' distress with looks of concern or heightened attention, and later at 18 months respond with instrumental behaviors, such as bringing the mother a toy or attempting to care for her injury (e.g., kissing, patting) (Zahn-Waxler et al., 1992). A similarly goal-directed behavior, albeit distinct in its manifestation, was observed by Strayer (1980), who reported that some 5-year-old children responded to a peer's distress by becoming angry at the perceived cause of the distress. We believe such prosocial and empathic responding to pain/distress/sadness is a differential response to negative emotion that one would not expect to occur in response to other negative emotions (e.g., disgust).

Although the studies by Zahn-Waxler and colleagues eloquently demonstrate the prosocial approach behaviors of infants, avoidant behaviors may be similarly effective and demonstrative of attempts to alleviate the distress of another. In the study by Camras (1977), when a kindergartner's attempt to take the gerbil from a peer resulted in the peer displaying sadness, the kindergartner waited significantly longer before re-attempting to take the gerbil. In contrast to peer responses of overt aggression, this was the only non-aggressive display by the peer to increase the waiting time before observing the child's next re-attempt. This "providing space" response may be indicative of a functional response intended to alleviate the individual's distress by lessening attention on the victim (imagine instances in which one wishes to be "left alone" or "not talk about it").

Based on the empirical examples highlighted above, one can clearly see that while the approach and avoidance of the response may vary, the function is the same. Whether one responds to a sad friend by prompting discussion, providing a shoulder to cry on, or giving the friend space, the goal is similar. When evaluating behaviors, particularly avoidant behaviors, careful attention to the nuances of the behavioral response is necessary to accurately infer the function of the behavior.

Disgust

Disgust displays elicit responses of increased attention to and avoidance of the referent, but little security seeking. This response was demonstrated in a study by Hornik, Risenhoover, & Gunnar (1987), in which 12-month-old infants observed their parent express positive, neutral, or negative (disgust) affect toward a novel toy. Infants in the disgust condition played significantly less with the target toy, but their proximity to the mother did not vary by condition. Rather, the infants continued playing with the other toys in the room and avoided the disgust-labeled toy. Thus, although infants avoided the disgust toy, they did not seek security from the parent as infants responding to messages of fear often demonstrate (Klinnert, Emde, Butterfield, & Campos, 1986).

Additionally, the individual may explore the referent by approaching or manipulating the target of the emotion display in order to better understand what specific aspect or quality of the referent elicited the disgust display. Vaish and Woodward (2010) found that infants observing an experimenter's disgust display toward the contents of a cup increased their looking at the event in comparison to a positive display. While this may be the result of a bias to direct attention to negatively valenced stimuli, it may also be explained by infants attempting to gain more information about the contents of the cup. Findings by Repacholi (1998) support this interpretation. In her study, an adult displayed either positive or disgust messages toward the contents of a box. Fourteen-month-old infants were willing to touch the box in both conditions, but infants in the positive condition were much more likely to physically explore the contents of the box. We believe that infant responses of stimulus

avoidant behaviors absent of caregiver proximity seeking may be a differential response unique to disgust displays.

Recommendations for Future Research on the Effects of Social Signals

Although empirical studies investigating infant development of instrumental responding to discrete emotions have demonstrated primarily null or mixed findings, they are useful in elucidating a number of important considerations and implications for future research on the topic. In keeping with the functionalist framework we have laid out, we comment on what the existing research has lacked in investigating functional affective responding and provide criterial comments for empirical investigations. In particular, studies investigating affect specificity require that: (a) the context presented to the infant be appropriate given the negative emotions displayed, (b) infants be afforded the opportunity to exhibit differential behavioral responses to distinct negative emotions, and (c) researchers attempt to code the function of the behavioral response, not its manifestation.

The Contextual Appropriateness of the Emotion

The emotion display should be appropriate to the context in which it is observed to maintain ecological validity. Although one could concoct a story that fits most emotions to a given situation, it is important that empirical investigations use contexts that are fitting for the emotion being displayed. Violations of this consideration are apparent in the above review. For example, sadness displayed toward infant approach of the visual cliff (Sorce et al., 1985) is an odd reaction for a parent to have. Thus, the mixed findings reported in that study may stem from infants' confusion of how to appropriately respond to the parents' distress. Similarly, an experimenter's sadness directed toward a toy (Gendler-Martin et al., 2008) is out of place, unless that toy had just broken (Bingham et al., 1987). Likewise, disgust toward a novel toy (Hornik et al., 1987) is unlikely to occur, but disgust toward a food or a toy that had come into contact with something unsanitary would be much more naturalistic. In either scenario, a variety of negative emotions might naturally arise, such as disgust, anger, or sadness because the toy is now dirty/ruined (similar to the paradigm used by Bingham et al., 1987).

Affording Flexible Behavioral Responding

The context of the emotion display should both afford one the ability to respond differentially and permit researchers to infer infant differentiation of emotion by determining the function that behavior served. Although the study by Sorce et al. (1985) is exemplary in comparing many discrete negative emotions in a controlled context, the visual cliff paradigm is constrictive in how the infant may respond to the emotion displays. The option to cross or not cross the cliff is comparable to a simple measure of approach or avoidance. Similarly, paradigms in which the infant watches an experimenter while seated in a highchair greatly restrict the behavior with which the infant may respond. This was demonstrated in the study by Gendler-Martin et al. (2008), in which the infant was only able to play with or avoid a toy that is presented. The dichotomies of responses in the above studies fail to capture the rich repertoire of potential behavioral responses with which the infant may engage.

Utilizing Goal-Focused Coding Schemes

Many of the functional responses described in the previous section underscore the importance that researchers be cognizant of the principles of equifinality (that different emotions may result in the same behavior) and equipotentiality (that a single emotion may result in different behaviors) of emotion. It is crucial that analyses of behavior focus on the goal of the behavior and whether the behavior is functionally appropriate, not whether the behavior is termed "right" or "wrong" a priori. Multiple behavioral responses may be appropriate for a single context, necessitating that researchers analyze the organization and goal-directedness of the behavior (Campos, Mumme, Kermoian, & Campos, 1994). For example, the high chair-type paradigm used by Anderson (1994) found that infants were more likely to offer food to a sad experimenter than an angry or neutral experimenter. This finding was unlikely to have been the result of an a priori expectation of differential exploration or ingestion of the food, and illustrates the value of coding schemes that are flexible in capturing such unexpected, yet coordinated, responses. Furthermore, coding *specific* infant facial affect, rather than only valence, in conjunction with coordinated behavioral responses may help researchers infer whether infants differentiated between negative emotions.

The above approach does not advocate ad-libbed and vaguely defined coding schemes. On the contrary, it emphasizes the need for clear definitions of the functions of emotion responses—likely equipotential in their behavioral manifestation—captured by coding the coordination of multiple variables (e.g., proximity to stimulus/caregiver/emoter, tactile exploration of stimulus, looking, facial affect) to determine the function of the coordinated response.

Beyond the Intrapsychic

While much of the field of emotion research focuses on an individual's experience of emotion, less emphasis has been placed on investigating the individual's response to the emotions of others and the functions these responses serve. Researchers who wish to investigate social and emotional development are best served to study the two in tandem in order to make meaningful and ecologically valid contributions. As Keltner and Kring (1998) correctly write, "[i]t is in the context of social interactions where the social functions of emotion are likely to be most apparent" (p. 334). Findings from the perceptual development literature demonstrate that infants are capable of discriminating discrete negative emotions displayed multimodally at 4 months and unimodally at 5 to 7 months. However, research on when this discriminatory ability leads to functional social outcomes is

still required. By employing a functionalist framework of investigation, researchers can design empirical settings where differentiated behavioral responding may occur and functional motivations can be inferred. We believe that the development of infant responding to emotion progresses from detection of emotion displays in the environment, to discrimination of the perceptual differences in the quality of the emotion displays, which in turn leads to a gradual appreciation of the meaning of discrete emotion displays, and then finally culminates in functional affective responding through instrumental action to those displays. This review suggests this coordination may become evident in the second year of life, but more sensitive studies are needed.

A functionalist approach to the study of emotion attempts to look beyond surface level features of expressivity and arousal and examines the functions such responses serve. Consoling a sad individual is likely to vary based on our relationship with that individual (e.g., friend, foe, or stranger), the environmental affordances present (e.g., physically present or listening on the phone), and our prior knowledge of and experience with the person (e.g., their personality). However, regardless of its manifestation, each consoling response likely shares a common interpersonal function. If emotion research is to gain traction in its effort to relate empirical investigations with real-world phenomena, the study of emotion must move beyond the intrapsychic experience and approach emotion as a bi-directional interaction occurring in social contexts. While many theoretical writings on emotion stress such an approach, far fewer empirical investigations actually utilize one. We hope this review highlights the need for such investigations not only in developmental research, but in the field of psychology as a whole.

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