UNIVERSITY OF CALIFORNIA, MERCED

The communicative functions of discrete emotions

A dissertation submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Psychological Sciences

by

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To my parents, grandparents, and all generations before my time. This dissertation would not have been possible without your resilience, courage, and strength. This is for you.

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Acknowledgements

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Reschke, P. J., Walle, E., A, Knothe, J., M., & Lopez, L. D. (2018). The influence of context on distinct facial expressions of disgust. *Emotion.* Advance online publication.

Knothe, J. M., & Walle, E. A. (2018). Parental communication about emotional contexts: Differences across discrete categories of emotion. *Social Development,* 27, 247-261. doi: 10.1111/sode.12276

Reschke, P. J., Knothe, J. M., Lopez, L. D., & Walle, E. A. (2017). Putting "context" in context: Examining the effects of body posture and emotion scene on adult categorization of disgust facial expressions. *Emotion*, 18, 153-158. doi: 10.1037/emo0000350

Lopez, L. D., Reschke, P. J., Knothe, J. M., & Walle, E. A. (2017). Postural communication of emotion: Validation of distinct poses for five discrete emotions. *Frontiers in Psychology, 8*, 710. doi: 10.3389/fpsyg.2017.00710

Walle, E. A., Reschke, P. J., & Knothe, J. M. (2017). Putting social referencing and social appraisal back together again. *Emotion Review, 9,* 269-270. doi: 10.1177/1754073916674335

Walle, E. A., Reschke, P. J., & Knothe, J. M. (2017). Social referencing: Defining and delineating a basic process of emotion. *Emotion Review, 9*, 245-252. doi: 10.1177/1754073916669594

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Lopez, L. D., Reschke, P. J., Knothe, J. M., & Walle, E. A. (2017, July). Postural communication of emotion: Validation of distinct poses for five discrete emotions. Poster presented at the International Society for Research on Emotions, St. Louis, MO.

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Abstract

Emotion expressions communicate more than internal states; they function to signal the significant relations with our environment and guide how social partners may adaptively respond. This dissertation presents four studies investigating the communicative functions of discrete emotions. Chapter 1 provides an overview of how discrete emotions convey different information to observers by integrating prior theories of emotion and empirical research as support to the claims. Chapter 2 describes my first empirical study on different communicative functions of emotions through observing how adults highlight elements of discrete emotional contexts. Findings indicate that adults differentially highlight relational elements of emotional contexts as a function of the emotion being displayed. Chapter 3 expands upon the results of Chapter 2 by examining differential highlighting of relational elements in the context of parent-child discussions about emotions. The results paralleled those found in Chapter 2. Next, Chapter 4 follows up and expands the prior studies through investigating preschool-aged children's descriptions of face and context images of discrete emotions. Young preschool-aged children did not differentially highlight elements of emotional contexts, but older preschool-aged children did. Taken together, the first three studies reported in this dissertation provide evidence that discrete emotions communicate different information to an observer as indicated by their differential highlighting of relational elements. Chapter 5 applied this conceptualization of emotional communication to a behavioral paradigm to investigate the generalizability of emotions. Results indicated that children do not generalize preferences, or dis-preferences, to another individual as a function of the discrete emotion display. Other behavioral measures indicated a valence-based difference in responding which may have been due to the paradigm and ages tested. The theoretical framework and studies reported in this dissertation provide a strong foundation for future work on the communicative functions of discrete emotions.

Chapter 1: General Introduction

Emotions are relational. As such, their communication functions to signal relational significance to social partners. Appreciating emotion entails more than perceiving their signals; it requires understanding the relational significance of relevant aspects of the emotional context (see Barrett & Campos, 1987; Walle, Reschke, & Knothe, 2017). Yet, to the detriment of the field, considerable theory and research has examined emotions detached from such relational elements. This chapter highlights the importance for individuals (researchers included) to appreciate relational elements of significance that correspond with emotion communication. As a point of entry, I highlight how 5 widely studied discrete emotions (anger, sadness, disgust, fear, and joy) differ in their communication about such relational elements. In doing so, I specifically focus on how these discrete emotions vary in their corresponding relational elements and regulatory functioning in interpersonal transactions, and how this perspective can expand our understanding of emotion communication and responding.

What is Communicated by Emotional Communication?

Emotions are not merely internal phenomenological states contained within an individual; emotions are *about* and *in relation to* something (Deonna & Teroni, 2012; Gordon, 1974). Thus, to fully appreciate emotional communication, it is not enough to simply identify that an individual is angry. Rather, one must understand the intentional object of the emotion: *why*, *how*, and *at what* the individual is angry (Deonna & Teroni, 2012). This *aboutness* (see Gordon, 1974; Hobson, 1998) between a person and their environment is the crux of the emotion.

This notion of a relational aboutness of emotion is not new. Darwin (1872) and Dewey (1885) each viewed emotion as inherently about something of importance with regards to the goals of the organism. Thus, the relation of the individual and their perceived environment are constitutive elements that shape the quality of emotional experience (see Campos, Campos, & Barrett, 1989). When observing a child who is sad about their broken toy, it is not the child's tearful expression that constitutes the sadness context. Rather, what constitutes the context as one of sadness is the relation between the crying child and the broken toy; the relational significance *is* the emotion.

Importantly, emotions do more than help an individual to coordinate an adaptive response to the environment (Cosmides & Tooby, 2000); they communicate to available conspecifics the need for adaptive responding to environment. Furthermore, the particular emotion communicates specific information to an observer. This includes both indirect information (e.g., underlying evaluations/appraisals) and direct information (e.g., facial and postural expression of emotion) about an individual embedded within a particular context.

Thus, appreciating others' emotions necessitates identifying the "emotionally meaningful objects, events, or states" (Frijda, 2009, p. 266) in relation to the emoter. For example, observing an individual displaying fear is about more than realizing that the person is afraid. The observer must appreciate that the individual is relating with their environment in such a way that there is uncertainty and/or a threat in relation to the emoter (Barrett & Campos, 1987). Furthermore, such a person-environment relation does not only communicate that the fearful individual is afraid of, for example, the edge of a

cliff; it also communicates to an observer (e.g., an infant watching the scene unfold), be it ostensively or indirectly, that the drop-off is a dangerous and to be avoided, and thereby functions to regulate the observer's behavior (Klinnert, Campos, Sorce, Emde, & Svejda, 1983). Thus, affective displays are a powerful indicator of an individual's appraisal (e.g., their evaluations of the context: motive inconsistent, uncertain cause, low coping potential) and likely behavior (e.g., avoiding the dangerous cliff), and can serve to regulate the observers' subsequent behavior (e.g., observer should also avoid the cliff) (e.g., Fischer & Manstead, 2008; Hareli & Hess, 2012; Walle et al., 2017).

Emotions communicate qualitatively different information as a function of the particular discrete emotional context (e.g., sadness, fear, joy). Thus, I argue that the communication of discrete emotions differentially highlight particular elements of the significant individual-environment relation and the pattern with which these aspects are accentuated varies across emotions.

Aspects of Aboutness

The communicative value of a particular emotion differs as a function of the emotion and the context in which it occurs (Parkinson, Fischer, & Manstead, 2005; Walle & Campos, 2012). As such, discrete emotions highlight for the observer specific aspects of significance in the emotional context. However, the features most meaningful in an emotional context vary by the specific emotion being displayed (see Brosch, Pourtois, & Sander 2010). Two essential elements that constitute an emotions' aboutness are the *emoter* (e.g., the person displaying the emotion) and the *referent* (e.g., the object or situation at which the emotion is directed).

Barrett and Campos (1987) theorized that some emotions are more relevant for social communication with a relational partner (i.e., anger, sadness), whereas other emotions focus on survival in relation to a threat (i.e., fear, disgust). This is not to say that specific emotions are about only the referent *or* the emoter, but rather that specific emotional communication emphasizes aspects of the relational significance between these elements. In other words, the communicative value of the emotion may place more emphasis on the emoter or referent as a function of the relational context.

Consider witnessing an individual displaying *fear* in response to a dog. Although understanding the emotion of fear by an observer entails appreciating the emoter's significant relation with the dog, the immediate value of the communication for the observer is that the dog (i.e., the referent) is a threat deserving of attention and avoidance. Conversely, consider observing an individual expressing *anger* toward that same dog. As before, the observer needs to understand the significant relation between the person and their environment (anger). However, this emotional context is more likely to communicate relevant information regarding the angry individual (i.e., the emoter is someone who abuses animals) than the anger-eliciting referent (i.e., the dog) to the observer. In both of the above examples the observer perceives the emotional context. However, the signal value, and thus aboutness, of the emotional communication differentially concerns the referent in the former and the emoter in the latter.

This differential relevance of the emotional element is not dependent upon the concreteness of the referent but the emotion itself. One may be angered by computer crashing or saddened by a broken vase (tangible referents) just as one can be disgusted by injustice or fearful of an impending test result (less tangible referents). In each case, the

task for an observer is to identify the significant relational elements (emoter and referent) as a function of the emotion and to use this information to appropriately respond to the context. Below I incorporate theoretical and empirical evidence to illustrate how emotions highlight specific aspects of relational significance, and how this communication is perceived and utilized by social partners.

The aboutness and regulatory functions of discrete emotions

I argue that the above theoretical perspective is applicable to all emotions, albeit the degree of differential emphasis of the communication likely varies depending on the particular emotion of interest. Below I highlight research that provides evidence for differentiated attention and responding to 5 discrete emotions commonly studied in the literature: anger, sadness, disgust, fear, and joy. For each emotion, I first detail the relational significance communicated by the emotion, and then describe potential relational responses by an observer. By no means does this mean that my perspective is limited to only these emotions; rather, space constraints prohibit the inclusion of additional emotions in such detail.

Anger

Communicated Relational Significance of Anger. According to Lazarus (1991) the core-relational theme of anger is blaming a transgressor for an offense to oneself or a vulnerable individual. Indeed, anger is theorized to prepare an individual to strike or attack another individual (Darwin, 1872), and typically involves elevated heart rate and blood pressure (Levenson, 1992). This aligns nicely with Fessler's (2010) view that the evolutionary function of anger is to lessen or prevent a transgression against oneself or a significant social other (e.g., family, friends). Thus, the function and physiology associated with anger indicates that angry individuals are in a heightened state of readiness to overcome an obstacle. Such anger displays provide important information to the observer which guides how they attend and respond to the situation.

Research has examined how individuals attend to and detect angry faces. Such work commonly examines the efficiency and accuracy of detecting an emotional face within the context of many other distractors. The accuracy and efficiency for detecting angry faces is heightened compared with other emotions and has been termed the Anger Superiority Effect (e.g., Ceccarini & Caudek, 2013; Juth, Lundqvist, Karlsson, & Ohman, 2005; Savage, Becker, & Lipp, 2016). Additionally, angry faces moving toward, rather than away, from a participant are more likely to be recognized as anger (Nelson, Adams Jr., Stevenson, Weisbuch, & Norton, 2013). The increased accuracy of detecting an angry face when it moves toward an individual fits well with the notion that anger functions to ready the emoter for attack. Thus, increased attention toward the angry person could help an observer avoid harm. Observers rate anger expressions as more dominant and less affiliative than other emotion displays (Knutson, 1996). Indeed, personal experience with angry individuals facilitates attention to and detection of anger expressions. For example, children from abusive homes can more quickly identify expressions of anger than their non-abused peers, indicating that their prior experience heightens detection of angry individuals (Pollak, Messner, Kistler, & Cohn, 2009). The increased attention to and detection of anger is important for an observer in this emotional context.

Relational Responding to Anger. The above aspects of emotion perception and processing of anger expressions impacts how an observer responds in such contexts.

Specifically, when observing expressions of anger toward a referent, it is likely adaptive to increase attention to the emoter (angry person), who may be a potential threat to the observer, rather than to the referent. Empirical research supports this supposition. When anger is communicated towards a referent, observers are less likely to directly engage with the angry person rather than the object (e.g., Strayer, 1980; Walle, Reschke, Camras, & Campos, 2017). Consequently, infant responses to observing angry individuals are associated with heightened attention to and avoidance of the emoter, but not necessarily avoidance of the object (e.g., Camras, 1977; Walle, Reschke, Camras et al., 2017). For example, Repacholi and colleagues (Repacholi, Meltzoff, & Olsen, 2008) found that 18-month-old are sensitive to the distinction between an anger-tagged object and an anger-eliciting action. In this study, infants witnessed one adult react angrily to a second adult performing an action on a toy. The infant was then given the toy and allowed to respond for 20 seconds. In conditions in which the previously angry adult was not paying attention to the child (reading a magazine or having their eyes closed) or with the second adult present, the infant was more likely to repeat the action previously displayed. However, when the previous emoter was attending to the infant, they were less likely to repeat the action but did not necessarily spend less time touching or playing with the object. Thus, social avoidance is a common response to angry individuals though alternative responses directed toward the angry emoter include joining or asserting dominance over the angry individual (Walle & Campos, 2012). Regardless of whether the observer avoids, confronts, or joins an angry individual, the emoter is clearly the focus in such emotional contexts.

Sadness

Communicated Relational Significance of Sadness. In contrast to anger, sadness signals to others that the emoting individual needs help or comfort in dealing with an irrevocable loss (see Lazarus, 1991). Indeed, the facial and bodily expressions of sadness commonly have an inward focus toward the emoter. Recognizable expressions of sadness typically feature downcast eyes, downward turning of the corners of the mouth, lowering of the head, slumping of the shoulders, and a diminutive, inward posture (e.g., Darwin, 1872; Ekman, 1971; Lopez, Reschke, Knothe, Walle, 2017). Correspondingly, expressions of sadness motivate the sad individual to seek help for themselves and facilitate prosocial responding from other individuals (Frijda, 1986). Indeed, crying is considered an essential signal to solicit help from conspecifics and thereby facilitate survival (Bowlby, 1983). Empirical work finds that this social function of sadness can be exploited in particular contexts. For instance, adults are more willing to express and experience sadness when they expect that sad displays will elicit helpful responses from others (Hackenbracht & Tamir, 2010). The potential for sadness to elicit prosocial responding from others is an important function of the sad expression, making sadness a highly socially-relevant emotion (Barrett & Campos, 1987).

Relational Responding to Sadness. Observing a sad individual is likely to increase attention to the emoter so as to coordinate an adaptive social response (e.g., helping or comforting the emoter), whereas focusing on the lost referent (e.g., a totaled car, death of a loved one, broken toy) is of less concern. Although one might argue that the relational significance of loss would make a tangible referent less likely in sadness contexts, I would argue that the physical presence or concreteness of the relational object

need not be correlated with its elicitation of attention. For instance, one can be saddened by a broken vase (tangible) or the death of a loved one (intangible), yet the direction of attention is still increased in focus toward the emoter than the referent.

Displays of sadness motivate the observer to respond prosocially toward the emoter in an attempt to relieve the sad individual's distress (e.g., Stocks, Lishner, & Decker, 2009). When adults display concern for an observed sad experience (e.g., a sad video clip), they were more likely to behave prosocially toward the sad actor (Eisenberg et al., 1989). This response is observed in young infants who respond to a sad individual with increased prosocial responding, comforting behaviors, and verbal concern starting around 18 months (e.g., Spinrad & Stifter, 2006; Svetlova, Nichols, & Brownell, 2010; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Alternatively, an observer may divert attention away from the sad individual so as to not draw attention to their distress, and thereby "provide space" for the emoter to recover and rejoin the group (see Walle & Campos, 2012). However, even in such instances, the emoter is likely to be the primary focus of attention. Thus, displays of sadness place the emoter central within the emotional context.

Fear

Communicated Relational Significance of Fear. Fear serves the adaptive function of allowing the individual to identify, respond to, and communicate the presence of a threat to social partners. The canonical fear expression consists of widened eyes to increase visual perception, a slight opening of the mouth, and postural and physiological responses in preparation for self-preservative action (Darwin, 1872; Ekman, 1971; Ekman, Friesen, & Ellsworth, 1972). These actions help prepare the individual to take in more visual information and flee perceived threats. Such increased attention to the threatening referent is vital for adaptive responding to contexts of fear.

Research indicates that there is a strong attentional bias toward threatening objects. Children and adults more readily direct attention to and identify threatening stimuli, such as snakes or spiders, than non-threatening stimuli, such as flowers (LoBue & DeLoache, 2008), and have difficulty shifting attention away from fear-conditioned stimuli (Schmidt, Belopolsky, & Theeuwes, 2015). Individuals also more quickly detect, orient their gaze toward, and react more strongly to threatening stimuli than nonthreatening-negative, positive, or neutral stimuli (March, Gaertner, & Olson, 2017). For the observer, the communicated relational significance of a fear display is that a threat exists in the environment that necessitates attention. Impressively, adults can identify and use the referent to disambiguate the social partner's fear display even when the referent is presented with minimal exposure (Mumenthaler & Sander, 2012).

Relational Responding to Fear. The value of observing a fearful expression in a social partner is to identify the source of the threat and prepare oneself to engage in self-preservative behavior. Infant social referencing research shows that infants can appreciate the emotional display of fear and use another person's display of fear to regulate their own behavior in a situation (e.g., Sorce, Emde, Campos, & Klinnert, 1985). For example, 14-month-old infants explore a toy significantly less following an adult's fear display toward the object (Walden & Ogan, 1988). In addition, work on the visual cliff demonstrates that 12-month-old infants who view their caregiver pose a fear face toward the drop-off modify their behavior in relation to the situation and do not cross the cliff

(e.g., Sorce et al., 1985). Moreover, comparative research with non-human primates indicates that the presence of a stimulus is necessary for a fear display to condition fear responding in an observer (Mineka & Cook, 1993). Individual differences in fear responses may change over development as the observer accumulates more information (a point elaborated upon in Chapter 6). However, it appears that early in development, the presence of others' fear greatly influences an observer's attention and response towards fear-inducing stimuli in order to adaptively respond to the threatening referent.

Disgust

Communicated Relational Significance of Disgust. Expressions of disgust signal to social partners a need to attend to and avoid sensory contact with the disgusting object. Similar to fear, disgust motivates the protection of oneself from noxious stimuli (e.g., Darwin, 1872). Expressions of disgust typically include an avoidant posture but with less emphasis on physically protecting the self from bodily harm (see Lopez et al., 2017), and a face in which the nose is scrunched and the eyes are slightly squinted so as to shut off sensory input from noxious stimuli – though slight variations exist (e.g., Reschke, Walle, Knothe, & Lopez, 2019; Rozin, Lowery, & Ebert, 1994). As such, disgust-relevant stimuli tend to be biologically hazardous, such as contaminated food, disease-causing stimuli, or bodily fluids or discharges (Darwin, 1872; Oaten, Stevenson, & Case, 2009; Rozin & Fallon, 1987; Rozin, Millman, & Nemeroff, 1986; Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000). Such stimuli make it necessary to shut off one's sensory input and/or expel such stimuli from one's system. Perhaps unsurprisingly then, viewing of disgusting stimuli has been found to elicit a strong attentional bias toward the referent (e.g., Rubenkin & Lang, 2014).

Relational Responding to Disgust. The primary behavioral response associated with observing disgust expressions is avoidance of the targeted referent. Such avoidant behavior in response to disgust stimuli has been observed in 2.5-year-olds (Stevenson, Oaten, Case, Repacholi, & Wagland, 2010). However, disgust can also elicit increased visual interest or stimulus exploration of the referent which is not necessarily avoidant but aimed at getting more information about the disgust referent itself (see Stevenson et al., 2010; Vaish & Woodward, 2010; Walle, Reschke, Camras et al., 2017). Although these responses are distinct, both indicate increased focus on the referent of the disgust expression to gain information while also avoiding excessive contact with one's senses.

Joy

Communicated Relational Significance of Joy. Generally speaking, expressions of joy signal the positive value of a referent to an observer. However, empirical precedent for whether the focus when observing joy is increased toward the emoter or an external object is less clear. Displays of happiness can communicate that the emoter is friendly and trustworthy and thereby help facilitate social interactions (e.g., Cunningham, 1998a; Fredrickson, 1998; Harker & Keltner, 2001). Indeed, even newborn infants display a preference for happy faces over negative facial expressions (Farroni, Menon, Rigato, & Johnson, 2007). Conversely, joy expressions also signal the positive value of a referential object or experience and increase the focus of attention to the referent (see Gable & Harmon-Jones, 2008). For instance, young infants demonstrate an attentional bias toward positive, personally-relevant stimuli, such as food, over other positive stimuli, such as happy faces (see Pool, Brosch, Delplanque, & Sander, 2016). Thus, while prior research

is less clear on whether the emoter or the referent is of greater significance in joyful contexts, the commonality is that joy communicates positively valenced relational significance that motivates engagement with the environment (see Cunningham, 1988b; Frijda & Mesquita, 1994).

Relational Responding to Joy. Approach behaviors in response to joy expressions seem to be the common response regardless of whether one focuses more on the emoter or the referent. Infants demonstrate increased proximity to objects, toys, or food that is labeled with positive or joyful affect (Carver & Vaccaro, 2007; Hertenstein & Campos, 2004; Hornik, Risenhoover, & Gunnar, 1987). Likewise, adults tend to affiliate more or are more likely to view happy people as less threatening (e.g., Keating, Mazur, &Segall, 1981) and someone they would like to be friends with (see Knutson, 1996; Lyubomirsky, King, & Diener, 2005). Taken together, prior research is less clear as to the aboutness of joy placing the emoter or the referent central for the coordination of a relational response. However, such differential focus when observing communicated joy may depend more on specific elements of the relational contexts (e.g., who is the emoter, previous experience, personal relevance of the referent) than is the case for emotions that differentially highlight the emoter (i.e., anger, sadness) or the referent (i.e., fear, disgust).

Summary

In this section, I highlighted theoretical and empirical work examining how discrete emotions communicate different information about the emoter-environment relationship to an observer. I included five of the most commonly researched discrete emotions (anger, sadness, disgust, fear, and joy) as a starting point for this conceptualization of the communicative functions of emotions. The differences in communicative function is suggested to direct an observer's attention to and responses toward particular elements (referent, emoter) of the emotional context depending on which discrete emotion is being displayed. This differential attention to particular elements of emotional contexts was instantiated through theoretical and empirical works. Below I describe a set of studies that investigate the differential highlighting of elements of emotional contexts across these discrete emotions.

Current Set of Studies

In the subsequent chapters I examine how individuals use aspects of emotional contexts in their understanding of discrete emotional contexts. Specifically, I examine how (1) adults highlight elements of emotional contexts through their descriptions of emotional images, (2) caregivers highlight these elements when describing images to their infant, (3) children label and highlight elements of emotional images, and (4) infants generalize emoter- and referent-centered emotions.

This collection of studies will provide preliminary evidence for how individuals differentially understand and utilize aspects of emotional contexts as a function of the discrete emotion. Future research on this topic can explore how individuals visually attend to aspects of emotional contexts and examine how such attention may differ in other populations (e.g., different cultures, clinical populations, younger infants).

Chapter 2: Adult Communication About Discrete Emotional Contexts

Full appreciation of another individuals' emotion necessitates identifying the referent that the emotion is being expressed in relation to (Frijda, 2009). However, those features perceived as most meaningful in an emotional context vary by the specific emotion being displayed (see Brosch, Pourtois, & Sander 2010). For instance, witnessing anger or sadness expressions are likely to direct one's attention and responding towards the emoter so as to avoid their anger or alleviate their sadness, respectively (Eisenberg, et al., 1989; Pollak, Messner, Kistler, & Cohn, 2009; also see Keltner & Haidt, 1999). Witnessing someone display fear or disgust likely directs one's attention to the referent of the emotional communication and such stimuli increase and direct an individual's attention (e.g., LoBue & DeLoache, 2008). One way of examining such differences in focus on the emoter and referent between discrete emotions is through how adults talk about emotion contexts. This chapter aimed to investigate the arguments and ideas proposed in Chapter 1 by examining how adults verbally highlight aspects of emotional contexts within their descriptions of discrete emotional contexts.

Language use is an important window into our psychological worlds and can tell us what is most salient to an individual (e.g., Pennebaker, Mehl, & Niederhoffer, 2003). McIntyre and Graziano (2016) have examined the differential selective attention toward people and objects when viewing different contexts. They measured individuals' orientations to people and objects through self-report to identify their underlying social or physical motivational nature. Participants were asked to click on the most important area of the image and write a story or description about the images to examine how their motivations related to their selective attention (measured by mouse clicks and word use). Individuals identifying as more person-oriented tended to identify the people in the images and use more person-related language; the opposite was true of the object-oriented individuals. Although this may seem like adult's attention is at the mercy of their individual differences, this does not negate the prior theoretical and empirically-based argument that different discrete emotions communicate and highlight particular features of the context. Individual differences in attention are important but were not examined across different emotions in the McIntyre and Graziano (2016) study. However, their methodology and results are an important step in understanding how attention relates to underlying motivations.

Comparison of attentional focus, measured by language use, across discrete emotion contexts has yet to be examined. In addition, descriptions of emotional contexts may highlight important features of the context such as the emoter, referent, and emotion label as these aspects are inherent in the communicative value of discrete emotions as explained in Chapter 1. Such was the aim of this study.

Current Study

In the current study, participants described emotion contexts depicted in images including a single individual expressing an emotion toward a clear referent. I predicted that adults would verbally reference the emoter more in anger and sadness contexts than in disgust and fear contexts. Conversely, I predicted that adults would verbally focus on the referent more in disgust and fear contexts than in anger and sadness contexts. Based on the mixed findings in the literature, no a priori predictions were made for joy.

Method

Participants

Seventy-six college students (39 male, M_{age} = 19 years, SD = 1.67) completed the study. I was unable to conduct an a priori power analysis in this study as the coding and comparisons in the present study were sufficiently distinct from prior research using similar methodology to prevent adoption of previously observed effect sizes. In a post-hoc power analysis, the sample size was determined to be sufficient using power calculations targeting power of .80 and 2-tailed pairwise comparisons yielding small to medium effect sizes (d = 0.30 to 0.35).

Participants were fluent in English and had normal or corrected vision and completed the study for course credit. Participants' average age was 19 years (range: 18 to 27 years) and identified as Hispanic or Latino (50%), Asian (15.8%), White (11.8%), Multi-racial (10.5%), Black or African American (7.9%), Pacific Islander (1.3%), and other (1.3%), with one individual declining to answer. Two additional participants were excluded due to discontinuing participation (n = 1) or experimenter error (n = 1).

Materials

Stimuli. A 13-inch MacBook laptop presented the instructions and stimuli via a timed PowerPoint presentation. Participants viewed a total of 13 images (see Appendix A for descriptions). Three neutral images (a kitten swatting a flower; a snail on a mushroom; a butterfly on a flower) were first displayed to familiarize participants with the procedures, followed by 10 images depicting an emotional scene. Emotion images featured one person (male or female) displaying a discrete emotion (i.e., anger, sadness, disgust, fear, or joy) toward a referent (e.g., a rat, a paycheck). Emotion expressions were consistent with previous research on emotional expressions and images were of average daily intensity.

Stimuli validation. A separate sample of undergraduate students (n = 15; 11 female) validated the stimuli. Raters identified the emotion expressed by the individual in each image from a list of 6 emotions (anger, sadness, joy, disgust, fear, and surprise) or an open-ended "other" option. Responses marked as "other" fitting within an emotion family (e.g., happy, frustrated, scared) were collapsed into the related emotion category; otherwise these responses were retained as "other." Agreement for the intended emotion for the emotion in the image was robust with all images obtaining over 90% agreement and Feliss' kappa values over .90 (Anger images = 90%, k= 0.94, Sadness images =100%, k= 0.98, Disgust images = 100%, k= 1.00, Fear images = 90%, k= 0.94, Joy images = 100%, k= 1.00).

Procedure

Participants completed a single lab visit lasting approximately 45 minutes. A trained researcher provided an overview of the procedures to the participant and participants completed consent documents and a demographic questionnaire. Participants then completed the experimental activities and their responses were recorded via the laptop's internal webcam. Participants completed other tasks during the visit, but the image description activity always occurred first.

Image description activity. Participants were shown a series of images presented on the computer. The participants were instructed by the following prompt at the start of the activity:

> "For this activity, you will be asked to look at a series of images. Each image will appear for 30 seconds. Following the image will be a 5-second break before the next image appears. For each image, please describe out loud the context of what is happening in the picture like it is a story."

Three neutral images were shown to familiarize participants with instructions for the activity, followed by images depicting discrete emotion scenes (e.g., a man disgusted by a plate of broccoli). The presentation of each image was separated by a 5-second fixation cross. The 10 emotion images were presented in a randomized order with the exception that the same two discrete emotions were never displayed consecutively. The randomized order was generated for each participant.

Coding

Trained researchers transcribed verbatim participant verbal responses during each activity. A primary coder coded the specific words of interest (see below), with 25% of transcripts coded by a secondary coder to determine reliability. Reliability was calculated through Pearson's correlations and mean differences are provided below.

Total Words. The total number of on-task words were counted. Talk not relating to the activity (e.g., the participant commenting about the time remaining or the computer) was excluded from the Total Words measure. Reliability was high (r = .98, $M_{difference}$ = 0.09 words). Trained researchers naïve to the hypotheses of the study then coded the on-task words from each transcript for participant talk mentioning the specific variables of interest.

Emoter. The emoter was the individual experiencing the emotion. Words indicating the emoter included but were not limited to: *he, she, they, him, her, woman, man, boy, girl, I, me.* Reliability was high (r = .98, $M_{difference}$ = 0.01 words).

Referent. The referent was the object or situation towards which the emotion was related. Words indicating the referent included but were not limited to: *alarm clock, broccoli, milk, computer, fired, car,* and *duck.* Reliability was acceptable (r = .90, $M_{difference}$ = 0.21 words).

Emotion Label. The emotion label was defined as instances mentioning the target emotion or related emotion terms. Words indicating the target emotion for joy (e.g., happy, excited), anger (e.g., mad, pissed), sadness (e.g., depressed, down), disgust (e.g., gross, icky), and fear (e.g., scared, frightened) were coded as emotion labels. Reliability was acceptable (r = .87, $M_{difference}$ = 0.08 words).

Results

Analytic Strategy

Participant communication was analyzed separately for each variable (total words, emoter, referent, and emotion label) using mixed linear models with a compound symmetry covariance structure and a Poisson distribution because the dependent variables were counts. Analyses of Total Words included the main effect of Emotion, as well as Participant Gender and Trial Number (i.e., each page of the book numbered by order of presentation) to control for fatigue. Analyses for particular types of words (i.e., Emoter, Referent, Emotion Labels) included the main effects of Emotion, as well as

Participant Gender, Total Words, and Trial Number to control for gender, verbosity, and fatigue, respectively. Additionally, analyses of Emoter and Referent terms in the image task included the size of the respective element in the image to control for perceptual differences of the images.

The main effects for Emotion and Gender are reported as standardized effect sizes (η^2). The results for all variables (main effects and control variables for each model) are reported in Appendix B Tables B1 – B4. Pairwise comparisons of discrete emotions with Bonferroni adjusted p-values are reported (see Table 1 for estimated means and standard errors). Preliminary analyses revealed no significant relations of participant age or race; thus these variables were excluded from subsequent models.

Table 1.

Estimated Means and Standard Errors of Image Description Activity from Chapter 2

	Anger	Sadness	Disgust	Fear	Joy
Variable	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Total Words	46.83 $_{D*\ J**}$	46.14 $_{J*}$	43.47 $_{A*\ F**}$	48.01 $_{D**\ J**}$	43.67 $_{A**\ S*\ F**}$
	(2.03)	(2.01)	(1.96)	(2.06)	(1.93)
Emoter	5.15 $_{S**\ J**}$	6.13 $_{A**\ D**\ F**}$	4.82 $_{S**\ J**}$	4.77 $_{S**\ J**}$	6.5 $_{A**\ D**\ F**}$
	(0.16)	(0.18)	(0.18)	(0.18)	(0.19)
Referent	2.1 $_{S**\ D**\ F**\ J**}$	1.74 $_{A**\ D**\ F**\ J**}$	4.17 $_{A**\ S**\ F**\ J**}$	3.16 $_{A**\ S**\ D**}$	3.23 $_{A**\ S**\ D**}$
	(0.14)	(0.13)	(0.21)	(0.15)	(0.2)
Emotion Labels	1.86 $_{S**\ D**}$	1.21 $_{A**\ F**\ J**}$	1.24 $_{A**\ F**\ J**}$	1.98 $_{S**\ D**\ J*}$	1.66 $_{F*\ S**\ D**}$
	(0.1)	(0.08)	(0.08)	(0.1)	(0.1)

Note: Estimated means and standard errors in parentheses. Letters next to each mean (S = sadness, F = fear, A = anger, D= disgust, J = joy) designate which pairwise comparisons were significantly different (* = $p < .05$, ** = $p < .01$). For example, participants labeled the emotion significantly more in Anger contexts than in Sadness contexts.

Total Words

Analysis of participants' Total Words revealed significant main effects of Emotion, $F(4, 743) = 7.36$, $p < .001$, $\eta^2 = 0.04$, and Participant Gender, $F(1, 743) = 5.38$, $p = 0.02$, $\eta^2 = 0.01$, $b = 0.19$, $SE = 0.08$.

Subsequent pairwise comparisons examined differences in Total Words between discrete emotional contexts. Participants said significantly fewer words when describing Disgust images than those of Anger, $t(743) = 2.86$, $p = .03$, $d = 0.14$, and Fear, $t(743) = 3.82$, $p = 0.001$, $d = 0.22$. Participants also said significantly fewer words for Joy images than Anger, $t(743) = 3.58$, $p = 0.003$, $d = 0.21$, Sadness, $t(743) = 2.99$, $p = 0.02$, $d = 0.18$, and Fear, $t(743) = 4.53$, $p < 0.001$, $d = 0.29$.

The pairwise comparison of Participant Gender revealed that men ($M = 48.89$, $SD = 18.09$) said significantly more words than women ($M = 42.03$, $SD = 19.05$), $t(743) = 2.33$, $p = .02$, $d = 0.42$.

Emoter

The analysis of mentioning the Emoter revealed a significant main effect of Emotion, $F(4, 741) = 38.48$, $p < .001$, $\eta^2 = 0.17$, but no effect of Participant Gender, $F(1, 741) = 2.39$, $p = .12$, $\eta^2 = 0.003$, $b = 0.07$, $SE = 0.04$.

Pairwise comparisons between discrete emotions revealed that participants referred to the emoter significantly more often for Sadness images than for Anger, $t(741) = 5.56$, $p < .001$, $d = 0.30$, Disgust, $t(741) = 6.76$, $p < .001$, $d = 0.58$, and Fear, $t(741) = 6.78$, $p < .001$, $d = 0.39$. Interestingly, participants referred to the emoter significantly more often for Joy contexts than Anger, $t(741) = 7.20$, $p < .001$, $d = 0.31$, Disgust, $t(741) = 7.82$, $p < .001$, $d = 0.53$, and Fear contexts, $t(741) = 8.75$, $p < .001$, $d = 0.39$.

Referent

Participant mentioning the Referent demonstrated a significant main effect of Emotion, $F(4, 741) = 24.50$, $p < .001$, $\eta^2 = 0.12$, but not Participant Gender, $F(1, 741) = 2.74$, $p = .10$, $\eta^2 = 0.003$, $b = 0.08$, $SE = 0.05$.

Comparisons across discrete emotions indicated that participants mentioned the referent significantly more often for Disgust images than those of Anger, $t(741) = 6.90$, $p < .001$, $d = 0.75$, Sadness, $t(741) = 8.29$, $p < .001$, $d = 1.07$, Fear, $t(741) = 5.67$, $p < .001$, $d = 0.30$, and Joy, $t(741) = 5.71$, $p < .001$, $d = 0.54$. Participants also mentioned the referent significantly more often for Fear than Anger, $t(741) = 4.68$, $p < .001$, $d = 0.43$, and Sadness, $t(741) = 6.49$, $p < .001$, $d = 0.75$. Additionally, participants mentioned the referent significantly more often for Anger than Sadness images, $t(741) = 3.50$, $p = .001$, $d = 0.34$, and significantly more often for Joy than Anger, $t(741) = 3.87$, $p < .001$, $d = 0.24$, and Sadness, $t(741) = 5.30$, $p < .001$, $d = 0.59$.

Emotion Label

Participant labeling of the emotion demonstrated a significant main effect of Emotion, $F(4, 742) = 20.54$, $p < .001$, $\eta^2 = 0.10$, but no effect of Participant Gender, $F(1, 742) = 0.04$, $p = .85$, $\eta^2 < .001$, $b = 0.02$, $SE = 0.08$.

Pairwise comparisons revealed that participants labeled the emotion significantly more often for Anger images than those depicting Sadness, $t(742) = 6.13$, $p < .001$, $d = 0.58$, and Disgust, $t(742) = 5.86$, $p < .001$, $d = 0.60$. Participants also labeled the emotion significantly more often for Fear than Sadness, $t(742) = 7.05$, $p < .001$, $d = 0.74$, Disgust, $t(742) = 6.76$, $p < .001$, $d = 0.76$, and Joy, $t(742) = 2.73$, $p = .03$, $d = 0.35$. Additionally,

participants labeled the emotion significantly more often for Joy contexts than those of Sadness, $t(742) = 4.35$, $p < .001$, $d = 0.41$, and Disgust, $t(742) = 4.10$, $p < .001$, $d = 0.42$.

Discussion

Participants in the present study differentially focused on specific aspects of emotional contexts as a function of the discrete emotion. The results support the perspective that emotions have an "aboutness" (Gordon, 1974; Hobson, 1998) that highlights what is relevant to the self and social partners.

Specifically, adult descriptions of discrete emotion contexts partially supported the hypotheses of such differential attention. As predicted, participants highlighted the emoter more when describing images depicting sadness than those of fear and disgust. However, the predicted emphasis on the emoter was not present for anger, a point discussed in greater detail below. Interestingly, joy contexts elicited significantly more mentioning of the emoter than all emotions except sadness. Also in line with the predictions, the referent was more frequently mentioned when describing disgust and fear images than those of anger and sadness. Joy elicited more mentioning of the referent than anger and sadness. Additionally, participants labeled the emotion more when viewing anger, fear, and joy contexts than sadness and disgust contexts.

This differential emphasis across discrete emotion categories partially supports prior theory suggesting such distinctions (see Barrett & Campos, 1987) and fits with prior empirical research separately examining discrete emotions. One instance in which the results did not align with prior theory and research was in anger contexts. Results did not provide evidence for the hypothesis that anger contexts would elicit more talk about the emoter. However, prior work finds that adults provided with information about an individual who is angry or fearful tend to apply trait anger, but not trait fear, to that person (Galperin, Fessler, Johnson, & Haselton, 2013), suggesting that the anger can become "attached" to the person in a way that fear may not. The lack of significant results for highlighting the emoter for anger images may be due to the particular images used in this study. Anecdotally, participants tended to provide a short description of the images but would then relate the image (i.e., woman angered by alarm clock and man angered by computer) to themselves which may have decreased the amount of emoter terms used by the participants. More standardized images could ameliorate this issue and is discussed in Chapter 6.

Results for the emotions of sadness, disgust, and fear were more in line with the hypotheses and prior research. For instance, research examining responses to others' sadness indicates a similar focus on the emoter, but with a functional response towards the sad individual (Stocks et al., 2009) rather than social avoidance of the emoter observed in response to anger (Walle, Reschke, Camras et al., 2017). Conversely, disgust and fear are theorized to warn the observing individual of a possible referential threat (Darwin, 1872). Heightened attention toward the referents of disgust and fear communications likely facilitates efficient identification of (LoBue & DeLoache, 2008) and responding to (Öhman & Mineka, 2001) such stimuli.

Interestingly, observing joy contexts resulted in high amounts of mentioning both the emoter and the referent. While this may seem odd at first, similar ambiguity exists across studies finding dominance toward facial displays of joy (e.g., Ceccarini & Caudek, 2013) or attentional focus toward a positive referent (e.g., Gable & Harmon-Jones, 2008).

It may be the case that joy elicits heightened attention to the context as a whole, though perhaps not with the associated vigilance seen for negative emotions. Further investigation is needed to replicate these findings in other populations.

Chapter 3: Parental Communication About Discrete Emotional Contexts

The results of Chapter 2 indicate that adults differentially describe aspects of emotional contexts as a function of the emotion being displayed. Adult talk about emotions serves an important role in emotional development. Caregiver talk about emotions helps guide the child's attention to particular aspects of emotional contexts (e.g., Thompson, 2006), thereby facilitating appropriate attention and responding. Examining how parents' guide their children's attention to elements of discrete emotion contexts has important implications for understanding parental socialization practices that contribute to infant's social and emotional development. To extend Chapter 2 developmentally, the study presented in this chapter investigated how parents verbally highlight elements of emotional contexts when reading a picture book to their infants.

Parent talk about emotion and mental states has been linked with a range of concurrent social skills, such as 18- and 30-months-olds prosocial behaviors (Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013), 3- and 5-year-olds emotional competence and theory of mind (LaBounty, Wellman, Olson, Lagattuta, & Liu, 2008; Racine, Carpendale, & Turnbull, 2007; Ruffman, Slade, & Crowe, 2002), and preschoolers' emotional understanding (Garner, Jones, Gaddy, & Rennie, 1997). Furthermore, the quality of such parent talk differs across child gender. Parents more frequently engage in emotion and mental-state talk with daughters than sons, a finding observed in children ranging in age from 18 months to 5.5 years (e.g., Adams, Kuebli, Boyle, & Fivush, 1995; Drummond, Paul, Waugh, Hammond, & Brownell, 2014; Kuebli & Fivush, 1992). This disparity may help account for subsequent gender differences in emotional awareness (e.g., Feldman Barrett, Lane, & Schwartz, 2000) and regulation (e.g., McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008). Thus, studying parent emotion talk, particularly in the second year of life, provides an important window into emotional development. However, the majority of this research has suffered from a critical limitation: collapsing all emotion categories together and not examining differences between emotion categories. Examining such differences is essential for understanding how infants and children develop distinct emotion categories and how parents may differentially emphasize particular aspects of specific emotions.

A longitudinal study by Lagattuta and Wellman (2002) provides evidence of possible differences between emotional valence. The investigators examined parent-child conversations about positive and negative emotions longitudinally from 2 to 5 years of age. Results indicated that parent-child conversations about negative and positive emotions differed in quality, but not in frequency. Specifically, in comparison to positive emotions, parent talk about negative emotions included larger emotion vocabularies, more frequent talk about the past, more mentioning of emotion causes, increased talk about other people, and more questions. These differences were present in 2-year-olds and became increasingly pronounced after age 3. Though informative, this study only examined differences in parent talk by the valence (i.e., positive, negative) of emotion. However, a valence-based approach precludes a full understanding of the development of discrete categories of emotion (Walle & Campos, 2012). Examining how parents talk with their infant about discrete emotions during the second year of life may help elucidate

the ontogeny of attention and responding to specific aspects of emotional contexts described in Chapter 1.

Current Study

This study investigated how parents differentially discuss discrete emotional contexts (anger, sadness, disgust, fear, and joy) in a picture book task. Eighteen- and 24-month-old infants were included because infants in this age range demonstrate an emerging appreciation for discrete emotions (see Walle, Reschke, Camras et al., 2017) and this is a period of considerable emotional development (see Walle & Campos, 2012). Amount of parent talk about the emotional contexts was predicted to increase with infant age (e.g., Lagatutta & Wellman, 2002). Additionally, and in accordance with prior research, I predicted that parents would talk more to girls than to boys about the emotional contexts (e.g., Drummond et al., 2014; Kuebli & Fivush, 1992).

Specific predictions regarding parent talk about discrete emotional contexts were three-fold. First, based on the findings from Chapter 2, I predicted that parents would mention the *emoter* more when describing sadness and joy contexts than fear and disgust contexts. Second, I predicted that parents would mention the *referent* more when describing fear, disgust, and joy contexts than anger and sadness contexts. Third, I predicted that parents would pose more questions to their infant about negative emotional contexts than positive emotional contexts in line with Lagattuta and Wellman (2002); *a priori* predictions were not made for differences between discrete emotions for parent questions.

Method

Participants

Thirty-nine infant-parent dyads (37 mothers) completed the study. Infants were divided into 2 age groups: 18-month-olds (n = 20, 11 female; M_{age}= 18.69, SD = 0.62) and 24-month-olds (n = 19, 10 female; M_{age}= 23.88, SD = 1.38). An additional 9 dyads took part in the study but were excluded due to technical malfunction (n = 1) or infant fussiness (n = 8). Participants were recruited from the California San Joaquin Valley. The majority of families had an income between $25,000 and $40,000 (range: less than $25,000 to $120,000). Infant reported ethnicity was 67% Latino and 33% Non-Latino. Dyads spoke in either English (n = 27) or Spanish (n = 12), whichever language the parent was most comfortable speaking.

Materials

Stimuli. A custom-made wordless picture book was comprised of ten 8” x 10” photographs. Each image depicted an emotional scene featuring a single emoter (a male or female child) posturally and facially displaying one of five discrete emotions (anger, sadness, disgust, fear, joy), and a clear, familiar referent related to the emotion (e.g., a piece of broccoli, a spider, a puppy). Affective expressions were consistent with previous research on emotional displays (e.g., Ekman et al., 1972). All emotion images were of normal, everyday intensity – no gruesome (e.g., amputation images) or obscene (e.g., fecal matter, racial prejudice) images were included. The images were identified from the Internet by a trained researcher and selected to be similar with respect to the emoter and referent in each context. Sample images from the picture book are provided in Figure 1. Descriptive information regarding each image is provided in Appendix C.

Figure 1. Sample images from the picture book activity (from upper left: Anger, Disgust, Joy, Fear) from Chapter 3. All images were presented in random order, with exception that the same emotion was not repeated sequentially.

Stimuli validation. A separate sample of 77 adult participants (37 female; M_{age} = 19.97, *SD* = 1.66) validated each of the picture book images. Raters viewed the complete image and identified the emotion expressed by the child in each image from a list of 6 emotions (anger, sadness, disgust, fear, joy, and surprise) and an open-ended "other" option. Answers to the "other" option that fit within an emotion family (e.g., happy, frustrated, scared, afraid) were collapsed into the aforementioned emotion categories; otherwise they were retained as "other" and counted as a disagreement. Percentage agreement (i.e., identifying the intended emotion for the image) and Fleiss' kappa values were used as convergent means for validating emotional stimuli (e.g., de Gelder & Van den Stock, 2011). The overall agreement for the target emotion (i.e., the intended emotion of the image) was 91% (Anger = 84%, *k*= 0.89; Sadness = 98%, *k*= 0.97; Disgust = 97%, *k*= 0.96; Fear = 80%, *k*= 0.86; Joy = 94%, *k*= 0.96).

Procedure

Each dyad participated in a single lab visit lasting approximately 15 – 30 minutes. Upon arrival, a trained researcher provided an overview of the procedures to the parent. After all questions were answered, parents were asked to complete consent documents and a demographic questionnaire. While the parent completed these forms, the child engaged in a short warm-up period during which s/he played with toys in the room with a second researcher.

Picture book activity. The parent was asked to describe the picture book to their child. The 10 images were randomly ordered with the exception that the same two emotions were never displayed in succession. The child was seated on the parent's lap or next to the parent on a couch. Parents were instructed to describe each image to their child as if it were a separate story and progress through the book at their own pace. The picture book activity lasted an average of 3.80 minutes (*SD* = 1.35). A video camcorder on a tripod recorded all verbal and nonverbal behaviors.

Coding

Trained researchers transcribed verbatim all English and Spanish verbalizations by the parent during the picture book activity. A primary coder then counted the frequency of parent word types and specific verbalizations of interest (see below). A secondary coder was used to code 25% of the transcripts. Pearson's correlation coefficients of interrater agreement for the frequency of each variable are reported below, along with corresponding mean difference statistics.

Parent words. The number of on-task words (i.e., words pertaining to each image) spoken by the parent (reliability: r = .95, $M_{difference}$ = -0.27, $SD_{difference}$ = 3.56, 95% CI [-7.39, 6.85]). Talk relating to off-task topics (e.g., the parent promising the child a trip to the store after the visit), attempts to obtain the child's attention, or responses to the child's fussiness were excluded from the total amount of parent words.

Emoter. Parent on-task words referring to the individual displaying the emotion in each image (reliability: r = .83, $M_{difference}$= -0.24, $SD_{difference}$ = 1.21, 95% CI [-2.66, 2.18]). Words indicating the emoter included, but were not limited to: *he, she, him, her, boy,* and *girl.*

Referent. Parent on-task words referring to the object or situation toward which the emotion was directed in the image (reliability: r = .81, $M_{difference}$= -0.07, $SD_{difference}$ =

1.28, 95% CI [-2.63, 2.49]). Words indicating the referent included but were not limited to: *green juice, broccoli, dog, puppy, ice cream, spider,* and *homework.*

Emotion label. Parent on-task words that labeled the target emotion or related emotion terms (reliability: r = .81, $M_{difference}$= -0.10, $SD_{difference}$ = 1.03, 95% CI [-2.16, 1.96]). Words indicating the target emotion for anger (e.g., mad, frustrated), sadness (e.g., depressed, down, blue), disgust (e.g., gross, yucky, icky), fear (e.g., afraid, scared, frightened), and joy (e.g., happy, joyful) were coded as labeling the emotion.

Parent questions. Parent questions about each image were coded (r = .97, $M_{difference}$= -0.19, $SD_{difference}$ = 0.57, 95% CI [-1.33, 0.95]). Only questions in reference to the picture book (e.g., is he sad or happy that his ice cream fell?) were counted. Questions that were rhetorical (e.g., she is mad, huh?) or unrelated to the page (e.g., you want your snack?) were excluded.

Results

Analytic Strategy

Parent communication was analyzed separately for each of the above variables using mixed linear models with a compound symmetry covariance structure[1]. I present results by emotion valence (*positive*: joy; *negative*: sadness, fear, anger, disgust) and discrete emotion category; the former was included to accommodate comparison with prior research and the latter that was of central interest to the study. Analyses of the independent variables were conducted with the following models in Statistical Package for the Social Sciences, Version 23.

The analysis of Parent Words included Picture Emotion and Infant Gender as main effects, as well as Trial Number to control for fatigue, Language Spoken (i.e., English or Spanish), Infant Age, and Family Income. Analyses of specific word/verbalization types (i.e., Emoter, Referent, Emotion Labels, Parent Questions) included main effects of Picture Emotion and Gender, as well as Parent Words to control for parent verbosity, Trial Number, Language Spoken (i.e., English or Spanish), Infant Age, and Family Income. Additionally, analyses examining parent mentioning of the emoter or referent included the size of the respective element in the image to control for differences across images in the size of the specific element (i.e., size of the emoter or the referent). Zero-order correlations revealed that neither mentioning of the emoter and emoter size (r = -.08, p = .12), nor mentioning of the referent and referent size (r = -.03, p = .56) were significantly correlated. However, the respective sizes accounted for some of the variance in the emoter and referent models, and were thus included in the models as control variables.

Results for analyses by Emotion Valance include the unstandardized regression coefficients and corresponding means and *SD*s of each valence. The main effects (i.e., Discrete Emotion and Gender) for the discrete emotion models are presented with corresponding standardized effect sizes (η^2) in the text. The results for all variables (main effects and control variables for each model) are reported in Appendix D Tables D1 – D5.

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[1] Comparison of fit indices (i.e., AIC and BIC) of various covariance structures (i.e., compound symmetry, compound symmetry heterogeneous, Toeplitz, diagonal, and unstructured) revealed that a compound symmetry covariance structure was best suited for the data.

Additionally, each model also included pairwise comparisons for significant main effects and included a Bonferroni correction. Results with adjusted p-values are displayed below. Estimated means and standard errors for each discrete emotion are reported in Table 2.

Table 2.

Estimated Means and Standard Errors of Each Main Variable Across Discrete Emotions from Chapter 3

	Anger	Sadness	Disgust	Fear	Joy
Variable	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Total Words	30.22	34.08 $_{J*}$	32.36	32.3	27.9 $_{S*}$
	(2.57)	(2.57)	(2.57)	(2.58)	(2.58)
Emoter	5.4 $_{D** F** J**}$	5.04 $_{D** F** J**}$	3.66 $_{A** S** F**}$	2.6 $_{A** S** J** D**}$	3.79 $_{A** S** F**}$
	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)
Referent	1.68 $_{D** F** J**}$	1.99 $_{D** F** J**}$	3.14 $_{A** S**}$	3.75 $_{A** S**}$	3.77 $_{A** S**}$
	(0.19)	(0.25)	(0.21)	(0.20)	(0.25)
Emotion Labels	1.82 $_{J**}$	1.57	1.68 $_{J*}$	1.48	1.11 $_{A** D*}$
	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)
Parent Questions					
Male Infants	1.42 $_{Fe*}$	1.28 $_{Fe*}$	1.71 $_{Fe**}$	1.67	2.01
	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)
Female Infants	2.43 $_{Ma*}$	2.23 $_{Ma*}$	2.82 $_{Ma**}$	2.11	2.68
	(0.31)	(0.31)	(0.31)	(0.31)	(0.32)

Note: Estimated means with standard errors in parentheses. Letters next to each mean (S = sadness, F = fear, A = anger, D= disgust, J = joy) designate which pairwise comparisons were significantly different (* = $p < .05$, ** = $p < .01$). For example, parents labeled the emotion significantly more in Anger contexts than in Joy contexts. For Parent Questions, differences in the vertical subscripts next to each mean (Ma= male infants, Fe= female infants) designate which pairwise comparisons were significantly different by gender (* = $p < .05$, ** = $p < .01$). For example, parents asked significantly more questions to female infants than male infants when discussing Anger contexts.

Parent Words

Emotion Valence. Parents used more words when describing negative emotion contexts (M = 32.38, SD = 18.38) than positive emotion contexts (M = 27.97, SD = 15.42), $F(1, 321) = 8.52$, $p = .004$, $b = 4.66$, $SE = 1.60$. However, no effect of infant gender was present, $F(1, 32) = 0.001$, $p = .98$, $b = 0.12$, $SE = 5.05$.

Discrete Emotions. The analysis of Parent Words revealed a significant main effect of Picture Emotion, $F(4, 318) = 3.09$, $p = .02$, $\eta^2 = 0.04$. However, Parent Words did not differ by Infant Gender, $F(1, 32) > 0.00$, $p = .98$, $\eta^2 < 0.00$, $b = 0.10$, $SE = 5.05$.

Pairwise comparisons examined differences in Parent Words between discrete emotional contexts. Parents used significantly fewer words in describing Joy images than images depicting Sadness, $t(318) = 3.27$, $p = .01$, $d = 0.37$.

Emoter

Emotion Valence. Parents mentioned the emoter significantly more often when describing negative emotion contexts (M = 4.27, SD = 2.89) than positive emotion contexts (M = 3.56, SD = 2.43), $F(1, 322) = 4.99$, $p = .03$, $b = 0.65$, $SE = 0.29$. However, no effect of infant gender was present, $F(1, 32) = 0.54$, $p = .47$, $b = 0.49$, $SE = 0.67$.

Discrete Emotions. Analysis of parent mentioning the emoter revealed a significant main effect of Picture Emotion, $F(4, 317) = 28.05$, $p < .001$, $\eta^2 = 0.26$, but not Infant Gender, $F(1, 30) = 2.02$, $p = .17$, $\eta^2 = 0.06$, $b = 0.47$, $SE = 0.33$.

Pairwise comparisons were conducted to examine differences in mentioning the Emoter across discrete emotions. Parents referred to the emoter significantly more often for Anger images than images depicting Disgust, $t(316) = 5.92$, $p < .001$, $d = .68$, Fear, $t(318) = 9.15$, $p < .001$, $d = 1.01$, and Joy, $t(315) = 5.20$, $p < .001$, $d = 0.72$. Additionally, parents referred to the emoter significantly more often for Sadness contexts than contexts of Disgust, $t(317) = 4.45$, $p < .001$, $d = 0.64$, Fear, $t(315) = 8.25$, $p < .001$, $d = 0.92$, and Joy, $t(319) = 3.95$, $p = .001$, $d = 0.66$. Parents also referred to the emoter significantly more often for Disgust than Fear, $t(316) = 3.69$, $p = .003$, $d = 0.31$, and for Joy than Fear, $t(318) = 4.27$, $p < .001$, $d = 0.27$.

Referent

Emotion Valence. Parents did not differ in their mentioning the referent when describing positive emotion contexts (M = 3.08, SD = 1.89) than negative emotion contexts (M = 2.80, SD = 2.40), $F(1, 323) = 0.51$, $p = .48$, $b = 0.20$, $SE = 0.27$, and no effect of infant gender was present, $F(1, 32) = 0.001$, $p = .98$, $b = 0.01$, $SE = 0.44$.

Discrete Emotions. Analyses examining differences in parent mentioning the referent revealed significant main effects of Picture Emotion, $F(4, 320) = 21.67$, $p < .001$, $\eta^2 = 0.2$. No significant effects were present for Infant Gender, $F(1, 32) = 0.001$, $p = .98$, $\eta^2 < .001$, $b = 0.005$, $SE = 0.17$.

Pairwise comparisons examined differences in parent mentioning of the referent between discrete emotions. Parents talked about the referent significantly more often for Disgust images than Anger, $t(320) = 4.88$, $p < .001$, $d = 0.93$, and Sadness images, $t(320) = 4.06$, $p < .001$, $d = 0.36$. Additionally, parents talked about the referent significantly more often for Fear images than Anger, $t(319) = 7.46$, $p < .001$, $d = 1.04$, and Sadness, $t(319) = 4.70$, $p < .001$, $d = 0.44$. Parents talked about the referent significantly more in Joy images than in Anger, $t(320) = 6.74$, $p < .001$, $d = 0.99$, and Sadness, $t(322) = 3.97$, $p < .001$, $d = 0.25$.

Emotion labels

Emotion Valence. Parents labeled the emotion significantly more often when describing negative emotion contexts (M = 1.68, SD = 1.58) than when describing positive emotion contexts (M = 1.03, SD = 0.97), $F(1, 322) = 13.41$, $p > .001$, $b = 0.61$, $SE = 0.17$. However, the effect of infant gender was not significant, $F(1, 32) = 3.24$, $p = .08$, $b = 0.51$, $SE = 0.29$.

Discrete Emotions. Examination of parent use of emotion labels revealed a significant main effect of Picture Emotion, $F(4, 318) = 3.39$, $p = .01$, $\eta^2 = 0.04$, but no significant effect of Infant Gender, $F(1, 31) = 3.53$, $p = .07$, $\eta^2 = 0.10$, $b = 0.51$, $SE = 0.27$.

Pairwise comparisons indicated that parents labeled the emotion significantly more often for Anger images than Joy images, $t(317) = 3.18$, $p = .02$, $d = 0.6$, and for Disgust images more often than Joy images, $t(318) = 2.90$, $p = .04$, $d = 0.43$.

Parent Questions

Emotion Valence. Parents asked as similar number of questions to their infant when describing positive emotion contexts (M = 2.12, SD = 1.95) and negative emotion contexts (M = 1.98, SD = 2.24), $F(1, 314) > 0.001$, $p = .99$, $b = 0.004$, $SE = .23$. However, a trending effect of infant gender was present, $F(1, 31) = 3.38$, $p = .076$, $b = 0.90$, $SE = 0.35$, with parents posing slightly more questions to girls (M = 2.48, SD = 2.49) than to boys (M = 1.48, SD = 1.64). Closer examination using pairwise comparisons indicated that parents asked more questions about negative emotions to girls (M = 2.49, SD = 2.54) than to boys (M = 1.42, SD = 1.68), $t(34) = 2.56$, $p = .015$, $d = 0.50$, but the differences between positive emotions was not significant (Girls: M = 2.44, SD = 2.27; Boys: M = 1.76, SD = 1.46), $t(87) = 1.14$, $p = .26$, $d = 0.36$.

Discrete Emotions. The total number of parent questions across discrete emotions was analyzed. The main effect of Picture Emotion was not significant, $F(4, 310) = 0.92$, $\eta^2 = 0.01$, $p = .46$. However, a significant main effect of Infant Gender was present, $F(1, 31) = 5.72$, $p = .02$, $\eta^2 = 0.16$, $b = 0.88$, $SE = 0.37$, with parents asking more questions to girls (M = 2.48, SD = 2.49) than to boys (M = 1.48, SD = 1.64).

Analyses also examined whether this gender difference in parent questions was present across emotion contexts. Pairwise comparisons revealed that parents asked significantly more questions to female infants than male infants for Disgust, $t(84) = 3.48$, $p < .001$, $d = 0.71$, images, and trending differences in the same direction were present for Anger, $t(83) = 1.91$, $p = .06$, $d = 0.45$, and Sadness, $t(85) = 1.73$, $p = .09$, $d = 0.51$. However, no gender differences were found for Fear, $t(86) = 0.90$, $p = .37$, $d = 0.28$, and Joy, $t(86) = 1.14$, $p = .26$, $d = 0.36$.

Discussion

This study found that parents differentially emphasized aspects of emotional contexts as a function of the emotion when describing emotion contexts to their 18- or 24-month-old infant. Although these differences were present between positive and negative valence of emotion, the analyses comparing discrete emotion categories provided important nuance to more clearly interpret the results (a point elaborated upon below). The total amount of parent talk to their infant varied across discrete emotion categories, with parents talking more about sadness contexts than contexts of joy. Parent emotion labeling also differed across emotion contexts, with joy being labeled significantly less than anger and disgust contexts. Further examination of what parents

discussed with their infant revealed several noteworthy distinctions between discrete emotions. In line with my predictions, parents mentioned the emoter significantly more often when discussing anger and sadness contexts than disgust, joy, and fear contexts, with fear being lower than all other emotions. Conversely, parents talked about the referent more in disgust, fear, and joy contexts than in sadness and anger contexts. These results are also in line with the predictions for Chapter 2. Interestingly, the results from Chapter 2 for anger contexts did not find the predicted differences in mentioning of the emoter when compared to disgust and fear contexts. It is possible that there were differences in the stimuli that caused the discrepancy in results (e.g., the anger referents in Chapter 2 were a computer and alarm clock and the current study's anger referents were a book and suitcase). However, I believe a more likely explanation is that caregivers in this study are communicating about these images with a different intent than the adult participants used in Chapter 2. Caregivers are describing the images with the intent to teach their infant about the emotional contexts (see Chapter 6 for further discussion). Such communication about emotional contexts is likely an important socialization mechanism for emotional development (e.g., Brownell et al., 2013; Drummond et al., 2014).

These differences in parent talk about discrete emotions mirror some findings of infant behavioral responses to such contexts, specifically infants' physical avoidance of disgust referents, engagement with sad emoters, and social avoidance of angry emoters (Walle, Reschke, Camras et al., 2017). However, it should be emphasized that although the frequency of parents' mentioning the emoter and the referent varied across discrete emotions, this does *not* signify that parents talked exclusively about one element or the other. Emotions are relational, and thus parent mentioning of *both* the emoter and referent (as well as other aspects of the context) should be expected so as to communicate the relational elements of the emotional context.

Additionally, parents asked more questions to girls than boys, particularly when discussing anger, sadness, and disgust contexts. Previous research indicates that parents initiate and elicit more conversations about emotions and mental states with daughters than sons (Dunn, Bretheron, & Munn, 1987; Drummond et al., 2014). The use of questions may be one way to engage in such discussions. However, and contrary to the predictions, no other gender differences were present for any of the other variables of interest. Previous research indicates that parents reminisce about past events and talk more about anger with their sons than their daughters (Fivush, 1989) and talk more about sadness with daughters than with sons (Fivush, Brotman, Buckner, & Goodman, 2000). However, gender differences may be dependent on the types of conversations and contexts in which the conversations occur (Fivush, 2007), and also the age of the child, which may account for the relatively few gender differences in the present study.

Surprisingly, how parents talked about discrete emotions with their 18- and 24-month-old infants did not differ for any of the observed variables. These findings are somewhat discrepant with those by Lagattuta and Wellman (2002), who found an increase in the quantity of negative emotion talk with infant age, though the authors also reported a lack of age differences in quality of talk about negative and positive emotions. The difference in results across studies may stem from the ages tested or methodology employed (e.g., at home recordings vs. a semi-structured picture book activity).

The Value of Examining Discrete Emotion Categories

The present investigation extends our understanding of how parents talk about emotions with their children, which to date had largely examined differences by emotion valence. The results clearly demonstrate the added value of analyzing discrete emotion categories. Consider the discrepancy in results between valence and discrete emotions for parent questions. While the valence analyses indicated that parents directed more questions to girls than to boys, the discrete analyses provided a much clearer picture, indicating this gender difference was specific to anger, sadness, and disgust, but not fear. Moreover, collapsing across discrete negative emotions hid some meaningful differences between discrete emotions. Specifically, mentioning the referent was higher for fear and disgust than for anger and sadness. However, analyzing this variable by valence resulted in a similar combined average for negative and positive valence, as combining the two high and two low negative emotions washed out the effect.

Given the importance of parent-child discussion of emotions (see Thompson, 2006), the observed differences between discrete emotions likely plays an important role in fostering children's emotional development. Parents in the current study showed differences in how they talked about discrete emotions to their infants, and infants in the present study were younger than most previous work on this topic. Such findings indicate that this differential parental talk about emotions may be a socialization process present early in development.

Chapter 4: Labeling and Descriptions of Discrete Emotions in Early Childhood

The results of Chapters 2 and 3 indicate that adults and caregivers differentially describe elements of emotion contexts. This communication about emotions may influence children's understanding of emotion contexts. Emotion understanding necessitates appreciating how individuals relate to their environment and the elements within the environment. For example, seeing a child crying while staring at a fallen ice-cream, one would infer that the child is sad *about* losing their valued treat. Such understanding involves labeling the emotional expression (e.g., sadness), as well as determining the relational significance between the individual (e.g., the child) and their environment (e.g., the dropped ice-cream). Although much research has studied children's labeling of emotion expressions, this falls short of assessing their understanding of how emotions are appreciated in context. The present chapter had two aims: (1) investigate preschoolers' labeling of emotion faces without and within contexts, and (2) examine specific relational elements that preschoolers highlight when describing emotional contexts (i.e., the emoter and referent).

Emotion Understanding in Young Children

A robust understanding of emotions requires the coordination of a variety of skills on the part of the individual. Individuals must recognize and understand the elements of the emotional situation, such as the facial and postural displays, the eliciting object or situation, and the likely responses associated with the emotion. Below I briefly review prior work examining preschool aged children's labeling of emotional faces without and within context, as well as the importance of considering how children appreciate specific aspects of emotional contexts.

Labeling Emotion Faces With and Without Context

Emotion labeling is a core feature of emotion understanding that has been extensively studied in young children and preschoolers (e.g., Widen & Russell, 2003; 2008; 2010a; 2010b). The Differentiation Model suggests that young children's emotion labeling emerges systematically (see Widen & Russell, 2008), initially including happy more than other labels and then gradually adding anger and sadness, followed by fear and surprise, and lastly disgust (e.g., Widen, 2013). This sequential unfolding of emotion labels over the first 5 years of life has been observed across a variety of face labeling and sorting tasks (e.g., Widen & Russell, 2003; 2008; 2010a; 2010b). However, the labeling of particular emotions may be influenced by the context (e.g., scenarios, previous experiences, referential objects), or lack thereof, in which the emotional display is presented.

Preschool aged children demonstrate considerable skill in accurately matching and labeling the emotional expression corresponding with different emotional scenarios and contexts (e.g., Denham, Zoller, & Couchoud, 1994; Dunn & Hughes, 1998) and this ability has been shown to contribute to later social and educational outcomes (e.g., Denham, 2006). However, studies of emotion labeling comparing stimuli with and without contextual information provide additional insight on how contextual elements influence labeling of specific emotions. In one study, children labeled what emotion a person was feeling from a solitary face image or after hearing a short vignette (Widen & Russell, 2010a). Findings in both conditions supported the Differentiation Model.

Interestingly, a subsequent study using these tasks found that children's labeling accuracy improved when fear, compassion, embarrassment, disgust, and shame were described in stories rather than presented as facial expression images (Widen & Russell, 2010b), though this finding was primarily for 2nd and 3rd graders. In addition, Leitzke and Pollak (2016) found that 4-year-olds more accurately identified images of disgust facial expressions presented in context (i.e., body holding a dirty object) than the face alone. However, this study only examined anger and disgust. Taken together, prior research suggests that the inclusion of more contextual information (in stories or images) increases children's ability to label emotions.

Clearly there is an important developmental progression in emotion labeling in early childhood. Additionally, providing contextual information with facial expressions may facilitate labeling of some emotions. However, research to date has not systematically compared emotion labeling of faces and faces in context across discrete emotions.

Appreciating Elements of Emotional Contexts

Beyond labeling emotions, understanding the relational significance of emotional communication necessitates attending to relevant aspects of the context. For example, labeling someone's facial expression as fear falls short of appreciating that the person's fear is in relation to an approaching tarantula. Although emotions inherently involve a relation between both the person *and* the object/event of significance, specific emotions may differentially increase attention toward the *emoter* (e.g., the person expressing the emotion) or the *referent* (e.g., the object, situation, or person towards which the emotion is directed) (see Chapters 2 and 3). Behavioral research supports the notion that the emoter or the referent may be differentially highlighted across discrete emotion contexts (see Chapter 1).

More explicit evidence for this differential emphasis on the emoter and referent can be found in adults' descriptions of emotional contexts found in Chapters 2 and 3. However, whether children's verbal descriptions of emotional contexts mirror adults' descriptions remains unstudied. Therefore, the present investigation examined whether preschool children differentially highlighted the emoter or referent when describing discrete emotional contexts.

Current Study

This study investigated how 3.5- and 4.5-year-old children labeled and described discrete emotion faces and contexts. I used these two age groups because the Differentiation Model indicates that between 3- and 5-years-of-age children begin to accurately use fear and disgust labels (Widen & Russell, 2008). Thus, to investigate the differences across anger, sadness, disgust, fear, and joy, I chose two ages that would potentially reflect important developmental differences in their emotion labeling and highlighting of relational elements.

First, based on the Differentiation Model (Widen & Russell, 2008), I predicted that 3.5-year-olds would be more accurate in labeling the emotions of anger, sadness, and joy than fear and disgust. I also predicted that 4.5-year-olds would be more accurate in labeling all of the emotions except disgust. Next, I compared children's labeling of emotion face images (no contextual cues provided) and emotional context images (one emoter displaying an emotion toward a single referent). I predicted that children would

more accurately label emotional context images than face images, particularly for fear and disgust because the context images included relevant information concerning the emotional referent which could help disambiguate the facial expressions.

Second, I examined children's highlighting of the emoter and the referent when describing discrete emotion contexts. In accordance with prior research on parent descriptions of discrete emotion contexts (Chapter 3), I predicted that children would reference the emoter more when describing anger, sadness, and joy contexts than disgust and fear contexts. Conversely, I predicted that children would talk more about the referent when describing disgust, fear, and joy contexts than anger and sadness contexts. I also predicted that 4.5-year-olds would demonstrate more pronounced differences in emphasizing aspects of the relational context between discrete emotions than the younger children.

Method

Participants

Forty-six child-parent dyads (40 female caregivers) completed the study. Two age groups were tested: 3.5-year-olds (n = 22, 13 females; M_{age}= 3.53 years, SD = 2.77) and 4.5-year-olds (n = 24, 11 females; M_{age}= 4.53 years, SD = 1.63). Eight additional dyads participated but were excluded because of child inattention (n = 3), a non-English language was spoken (n = 3), or experimenter error (n = 2). Prior research using similar methods and analyses (i.e., Chapter 3) have reported medium to large effect sizes. Thus, I anticipated medium effect sizes as a conservative estimate due to the difference in populations (i.e., adult vs. child talk). A power analysis determined that a sample size of at least 21 children for each age group would provide power of .80.

Participants were recruited from the California Central Valley through the Department of Public Health state birth records and community recruitment events. Most families had an income between $25,000 and $40,000 (range: < $25,000 to > $150,000). Child racial demographics reflected those of local area, with parents identifying children as 37% White, 35% mixed-race, 26% Hispanic, 2% no answer.

Materials

Stimuli. A custom-made picture book was comprised of fifteen 8" x 10" photographs. The first 5 images depicted different children's faces (gender-matched to the participant) expressing one of five discrete emotions (i.e., anger, sadness, disgust, fear, joy). The remaining 10 images depicted an emotional scene featuring a single emoter (i.e., a male or female child; different models than the face images) displaying an emotion and a clear referent related to the emotion. The first 5 face images were presented randomly and were followed by the 10 context images, randomly ordered with the exception that the same emotion context was never presented in succession. Participants received one of 20 different orders of randomized orders of images.

Stimuli selection and validation. *Face images.* All face images were selected from the CAFES image set (LoBue & Thrasher, 2015). Images featured a child (male or female) displaying a clear emotion. Images were selected on the basis of target emotion agreement ratings (all selected images had >75% agreement; see LoBue & Thrasher, 2015), as well as subjective clarity of emotional expression and similarity of face configuration across genders, as determined by the authors.

Context images. All context images contained a single emoter expressing (i.e., facially and posturally) one emotion (anger, sadness, disgust, fear, and joy) toward a single referent (an object; phone, broccoli, dropped ice cream, puppy). Images were of average daily intensity and previously validated (>80% agreement of the target emotion; see Chapter 3, Figure 1 and Appendix C).

Procedure

Each dyad completed the activity in a single visit to a campus research space. Upon arrival, a trained researcher provided an overview of the procedures to the parent. After all questions were answered, parents completed consent documents and a demographic questionnaire while the child engaged in a short warm-up period during which s/he played with toys in the room with a second researcher. Before starting the activity, parents were given explicit instructions by a researcher on how to guide their child through the book (described below).

Picture book activity. The parent and child were seated next to each other in separate chairs. Parents were asked to guide their child through the picture book and provided with the following verbalized instructions:

> "You will be guiding your child through this picture book. There are questions on the opposite page to each image. Please follow these questions but you may use some, or all, in whichever order you choose. Do not ask any leading questions, but asking general follow up phrases such as, 'tell me more' or 'why?' are fine. However little or much your child wants to say about each image is perfectly fine. Go at your own pace. Please do not point to any of the images but it is okay if your child points. We want their natural, unbiased response to the images."

An unrelated sample image (i.e., a kitten batting a flower) was provided with the instructions and used as a warm up image. After answering any parent questions, the experimenter and any siblings or additional adults left the room for the duration of the activity.

Each face image was accompanied by a page on the opposite side of the book with three questions: What do you see? What is she/he feeling? Can you tell me more? Each context image was accompanied by a page with four questions: What is going on? What do you see? What is happening? Can you tell me more? These questions were provided as non-leading, neutral ways for the parent to guide the child and elicit verbal responses.

The picture book activity lasted approximately 8:21 minutes (*SD* = 2:31) and two video camcorders on tripods recorded all parent and child behaviors.

Coding

Trained researchers naïve to the study hypotheses transcribed verbatim and coded all verbalizations by the parent and child during the picture book activity. A secondary coder was used to code 25% of the transcripts. Pearson's correlation coefficients of inter-rater agreement for the frequency of each variable are reported below, along with corresponding mean difference statistics for count variables or kappa value for binary variables.

Child talk. The total number of child words pertaining to each image were counted in each transcript to create a measure of *On Task Child Words* (reliability: $r = .97$, $M_{difference} = 2.9$ words) for each page (i.e., trial).

Talk relating to off-task topics (e.g., the child asking the parent what they would do after the activity) or responses to parent questions unrelated to the task (e.g., can you sit still?) were excluded from the total amount of child words. Additionally, leading parent questions or statements were marked (reliability: 95% agreement, $k_{=}$ .89) and child talk following such instances marked as off-task and not coded for that trial. This decision was made due to observed changes of child talk and attention as a result of leading parent questions and statements. The occurrence of parent leading utterances is reported in Appendix E. In addition, demographic variables (child age, gender, race, family income) were not significant predictors of parent leading utterances (all p-values > .05).

Face images. Researchers coded the transcript of each face emotion trial for child mentioning the correct emotion label or a related emotion term (reliability: 90% agreement, $k_{=}$ .79). Related emotion words indicating the target emotion for anger (e.g., mad, frustrated), sadness (e.g., depressed, down, blue), disgust (e.g., gross, yucky, icky), fear (e.g., afraid, scared, frightened), and joy (e.g., happy, joyful) were coded as labeling the emotion. Face emotion labels were coded dichotomously as either correct (1) or incorrect (0).

Context images. Researchers coded the transcript of each context emotion trial for child talk featuring the following:

Correct emotion label. Mentioning the target emotion or a related emotion term was considered an emotion label (Reliability: 94% agreement, $k_{=}$ .88). Context emotion labels were coded dichotomously as either correct (1) or incorrect/absent (0).

Emoter. The emoter in each image was classified as the individual displaying the emotion. Words indicating the emoter included but were not limited to: *he, she, him, her, boy,* and *girl.* Researchers coded the frequency of child mentioning the emoter on each page (Reliability: r = .91, $M_{difference}$ = 0.79).

Referent. The object or situation toward which the emotion was directed was considered the referent of the emotional display. Words indicating the referent included but were not limited to: *green juice, broccoli, dog, puppy, ice cream, spider,* and *homework.* Researchers coded the frequency of child mentioning the referent on each page (Reliability: r = .76, $M_{difference}$ = 0.21).

Results

Analytic Strategy

Analyses were conducted using mixed linear modeling. Separate models were used for each age group (3.5- and 4.5-year-olds) and controlled for child gender, trial number, on task child words, and the size of the emoter or referent, respectively, in the image. Significant effects were further examined with pairwise comparisons including a Bonferroni correction, and adjusted p-values are reported below. Estimated means and standard errors for each age group are reported in Table 3 and full models are reported in Appendix F Tables F1-F6.

Table 3.

Estimated Means and Standard Errors for 3.5- and 4.5-year-olds from Chapter 4

	Anger	Sadness	Disgust	Fear	Joy
Variable	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
3.5-year-olds					
All Labels	0.61 (0.08) $^{D^{**}\ F^{**}}$	0.69 (0.09) $^{D^{**}\ F^{**}}$	0.16 (0.05) $^{A^{**}\ S^{**}\ J^{**}}$	0.22 (0.07) $^{A^{**}\ S^{**}\ J^{**}}$	0.53 (0.09) $^{D^{**}\ F^{**}}$
Face Labels	0.52 (0.14)	0.76 (0.15)	0.13 (0.08)	0.24 (0.21)	0.60 (0.45)
Context Labels	0.70 (0.09)	0.62 (0.09)	0.18 (0.08)	0.21 (0.11)	0.45 (0.09)
Emoter	2.29 (0.23)	2.13 (0.23)	1.91 (0.22)	1.78 (0.23)	2.05 (0.22)
Referent	1.28 (0.16)	1.54 (0.20)	1.62 (0.17)	1.86 (0.17)	1.79 (.20)
4.5-year-olds					
All Labels	0.89 (0.06) $^{D^{**}\ F^{**}}$	0.81 (0.06) $^{D^{**}\ F^{**}}$	0.26 (0.06) $^{A^{**}\ S^{**}\ F^{**}\ J^{**}}$	0.51 (0.08) $^{A^{**}\ S^{**}\ D^{**}\ J^{**}}$	0.81 (0.07) $^{D^{**}\ F^{**}}$
Face Labels	0.93 (0.07)	0.80 (0.12)	0.14 (0.08) $^{CI^{*}}$	0.61 (0.14)	0.86 (0.10)
Context Labels	0.82 (0.07)	0.84 (0.06)	0.43 (0.10) $^{FI^{*}}$	0.42 (0.09)	0.76 (0.07)
Emoter	2.94 (0.22) $^{F^{**}}$	2.63 (0.22) $^{F^{*}}$	2.62 (0.23)	1.84 (0.22) $^{A^{**}\ S^{*}\ J^{**}}$	2.65 (0.22) $^{F^{**}}$
Referent	1.44 (0.16) $^{F^{**}\ J^{**}}$	1.06 (0.21) $^{D^{**}\ F^{**}\ J^{**}}$	1.67 (0.18) $^{S^{**}}$	2.15 (0.17) $^{A^{**}\ S^{**}}$	2.21 (0.20) $^{A^{**}\ S^{**}}$

Note: Estimated means with standard errors in parentheses. Letters next to each mean (S = sadness, F = fear, A = anger, D= disgust, J = joy) designate which pairwise comparisons were significantly different (* = $p < .05$, ** = $p < .01$). Letters next to each mean for Face and Context Images (FI = Face Images and CI = Context Images) designate which image types were significantly different within that emotion category. For example, 3.5-year-old children labeled the emotion significantly more in Anger contexts than in Disgust and Fear contexts and 4.5-year-old children referenced the emoter significantly more in Anger contexts than in Fear contexts.

Emotion labeling

Correct facial expression labeling was analyzed with a binomial distribution and logit link function. Each model included the main effects for picture emotion, picture type (face only, face in context), and the Picture Emotion x Picture Type interaction. Pairwise comparisons between emotion, picture type, and their interaction were explored.

3.5-year-olds. Analyses of the younger children revealed a significant main effect of picture emotion, $F(4, 304) = 11.24$, $p < .001$, $\eta^2 = 0.13$, but no significant main effect of picture type, $F(1, 304) = 0.01$, $p = .93$, $\eta^2 < 0.001$, Picture Emotion x Picture Type interaction, $F(4, 304) = 1.10$, $p = .36$, $\eta^2 = 0.014$.

Subsequent pairwise comparisons of the main effect of picture emotion revealed that 3.5-year-old children correctly labeled the images of anger, sadness, and joy more than disgust or fear (all p-values $\leq .004$).

4.5-year-olds. Analyses of the older children revealed a significant main effect of picture emotion, $F(4, 334) = 12.72$, $p < .001$, $\eta^2 = 0.13$, but not picture type, $F(1, 334) = 0.05$, $p = .82$, $\eta^2 < 0.001$. Interestingly, a significant Picture Emotion x Picture Type interaction was also present, $F(4, 334) = 2.43$, $p = .05$, $\eta^2 = 0.03$.

Further examination of the main effect of picture emotion revealed that 4.5-year-old children were significantly less likely to correctly label labeling disgust than anger, sadness, and joy (all p-values $\leq .001$). Additionally, older children more often correctly labeled anger, sadness, and joy than fear (all p-values $\leq .001$). Children correctly labeled fear more often than disgust $t(334) = 2.76$, $p = .025$, $d = .21$.

Next, I examined the significant Picture Emotion x Picture Type interaction. Pairwise comparisons revealed that 4.5-year-olds significantly labeled disgust more for context images (43%) than face-only images (13%), $t(327) = 2.18$, $p = .03$, $d = .50$, 95% CI [0.03, 0.57].

Context Descriptions

Descriptions of emotional contexts were analyzed with a normal distribution and identity link function. Models examining mentioning the emoter or the referent included the main effect of picture emotion and significant effects were further explored with pairwise comparisons.

3.5-year-olds. ***Emoter***. Analysis of 3.5-year-old children mentioning the emoter in the context images revealed no main effect of picture emotion, $F(4, 205) = 0.93$, $p = .45$, $\eta^2 = 0.02$. Thus, no pairwise comparisons were conducted.

Referent. Analysis of mentioning the referent revealed only a trending main effect of picture emotion, $F(4, 205) = 2.08$, $p = .09$, $\eta^2 = 0.04$. Again, pairwise comparisons were not examined. These results indicate that 3.5-year-old children did not differentially mention the emoter or the referent across discrete emotion contexts.

4.5-year-olds. ***Emoter***. Analysis of 4.5-year-old children mentioning of the emoter revealed a significant main effect of picture emotion, $F(4, 219) = 4.22$, $p = .003$, $\eta^2 = 0.07$. Subsequent pairwise comparisons revealed that older children mentioned the emoter significantly less often for fear context images than those depicting anger, $t(219) = 3.84$, $p = .002$, $d = .44$, sadness, $t(219) = 2.83$, $p = .041$, $d = .07$, or joy, $t(219) = 2.91$, $p = .036$, $d = .16$.

Referent. Analysis of mentioning the referent by 4.5-year-olds indicated a significant main effect of picture emotion, $F(4, 220) = 5.61$, $p < .001$, $\eta^2 = 0.09$. Pairwise comparisons revealed that older children mentioned the referent significantly more in disgust than sadness contexts, $t(219) = 2.87$, $p = .03$, $d = .52$. The referent was also mentioned more frequently in fear than anger, $t(220) = 3.44$, $p = .006$, $d = .54$, and more in joy than anger, $t(219) = 3.40$, $p = .006$, $d = .31$. In addition, children talked about the referent significantly more when describing fear than sadness contexts, $t(219) = 3.87$, $p = .001$, $d = .88$, more in joy than sadness contexts, $t(219) = 3.56$, $p = .004$, $d = .68$.

Discussion

This study indicates developmental differences in preschooler's emotion labeling and description of emotion contexts. Below I describe the results in relation to prior research, discuss limitations, and provide considerations for future research.

Emotion Labeling

Both age groups labeled anger, sadness, and joy more often than disgust and fear. This result is in line with Widen and Russell's (2003) Differentiation Model, with disgust and fear labels appearing later than other basic emotions. Interestingly, there were also important differences between image type for the 4.5-year-old age group. Specifically, older children labeled disgust more often when the expression was embedded in a contextual scene than presented through the face alone. This increased labeling for disgust when the emotion is presented with contextual information mirrors findings from Leitzke and Pollak (2016) where they found that 4-year-olds more accurately identified images of disgust faces when presented in context than presented as just the face alone. However, differences in labeling of the emotion featured in face-alone and the face in context for other emotions were not found.

My prediction that emotion labeling would be enhanced when presented in a context image was only partially supported. This hypothesis rested on the assumption that contextual information would make emotion identification easier for children. However, the added contextual information may make attention more diffuse or confuse children who are unable to appreciate the relational significance between the emoter and referent. For example, an image of a girl expressing disgust toward a piece of broccoli on her fork was described by one child as her blowing on the piece of broccoli to "cool it off" before eating it (see Appendix G Table G1 and G2 for full confusion matrix of emotion labeling). Thus, it is possible that contextual elements could distract from or distort children's labeling of emotional expressions. Such instances underscore the importance of considering emotional development as the child's ability to appreciate the relational significance between the individual and their environment, not simply labeling a facial expression.

Context Descriptions

Children also differed in highlighting the emoter and referent across emotion contexts. Whereas 3.5-year-olds talked about the emoter or referent similarly across emotion contexts, 4.5-year-olds' mentioning of emoter and referent terms varied. Specifically, older children talked about the emoter significantly more when describing anger, sadness, and joy contexts than fear contexts, and mentioned the referent significantly more when describing contexts of disgust, fear, and joy than those depicting anger and sadness. Thus, 4.5-year-old, but not 3.5-year-old, descriptions of emotional

contexts were generally in line with findings from Chapter 3, though increased mentioning of the referent when describing disgust contexts was not present at either age.

These results provide a more nuanced view of children's emotion understanding (e.g. Widen & Russell, 2003; 2010a; 2010b) and focus toward aspects of emotional contexts (e.g., Chapters 2 & 3). However, it should be noted that although younger children did not differentially describe aspects of emotional context, infants and toddlers do demonstrate differentiated behavioral responses to discrete emotions (e.g., Hornik et al., 1987; Walle, Reschke, Camras et al., 2017). Such behavioral research suggests that younger children may, in fact, appreciate the referential specificity of emotional contexts, but the verbal task demands in the present study may have obscured these capacities.

In addition, the images used were not standardized by the types of referents displayed (e.g., objects vs. agents). For example, images differed slightly with regards to the referent being an object or a possible agent. Specifically, the emotional context images for anger, sadness, and disgust featured object-referents and fear featured agent-referents (spider and dog), whereas joy had one image with an agent (puppy) and the other with an object (present). Even so, I believe it is unlikely that differences in the agency of the referent accounted for the findings for two reasons. First, although both agent- and object-referents were included, the 4.5-year-old children highlighted the referent more in fear (2 agents), disgust (2 objects), and joy (1 agent and 1 object) than in sadness (2 objects). This pattern of results indicates that the differences in referents (agent vs. object) was unlikely to have accounted for observed differences in mentioning the referent across emotional contexts. Second, no difference was observed in highlighting the referent between the two joy images, $t(430) = 0.43$, $p = 0.67$, $d = 0.09$, which would be expected if agent and object referents differentially elicited children's attentional focus. Even so, future research including more standardized images is recommended, particularly for the follow-up studies suggested in Chapter 6.

Chapter 5: The Generalizability of Discrete Emotions

Chapters 2, 3, and 4 have provided a clearer picture of how adults and children talk about elements of emotional contexts. However, it remains to be studied how such focus towards relational elements influences infants' behavior. Ostensive cues, such as verbal communication and referential expectations, are important for infant attention and social learning (Csibra & Gergely, 2009). The Natural Pedagogy Theory posits that early sensitivity towards ostensive cues was evolutionarily selected to help humans learn (Csibra, 2010; Csibra & Gergley, 2009) and perform cooperative behaviors necessary for social societies (e.g., Tomosello, 2008). These cues have been believed to "trigger in-built assumptions in the infant about the *generalizability* and *universality* of the epistemic information" (Gergely, Egyed, & Király, 2007, p. 141). This chapter investigates what type of information is communicated to an infant as a function of the discrete emotion (e.g., emoter- or referent-centered emotion).

Information that is communicated in an ostensive manner towards an object leads to the acquisition of object-centered knowledge and infants expect others to respond similarly to that object (Gergely et al., 2007). For example, in a canonical episode of social referencing, an adult will gain the child's attention and emote toward an object. The emotion of the adult thus should modulate the child's own response toward the object. In theory, this object-centered knowledge should also be applicable to other individuals (i.e., generalizable). If the information is not communicated ostensively, then it would not communicate such generalizable information and would lead to the acquisition of person-centered knowledge (Gergely et al., 2007). Thus, person-centered knowledge allows the infant to learn *about* others and object-centered knowledge allows the infant to learn *from* others (Csibra & Gergely, 2009; Gergely et al., 2007).

Some empirical studies on generalizability have unintentionally included affective displays (e.g., Buresh & Woodward, 2007; Henderson & Woodward, 2012; Novack, Henderson, & Woodward, 2014). However, only a handful of studies have intentionally tested differences in the generalizability of valenced displays (e.g., Egyed, Király, & Gergely, 2013; Liberman, Woodward, Sullivan, & Kinzler, 2016; Vaish, Grossman, & Woodward, 2015). Among these studies, there is little consensus about what emotions communicate (person- vs. object-centered information). A natural next step is to examine differences in generalizability between discrete emotions and such is the aim of the current study. Below I address the empirical instantiations of person- and object-centered knowledge in infancy and begin to address the mixed findings in the literature.

Generalizability of Preferences

Woodward and colleagues have conducted a line of work on infant's expectations of the generalizability of object labels and preferences through habituation paradigms. Such work has found that infants did not expect reaching behaviors to be generalizable across individuals (communicating person-centered information) and did expect object labeling to be generalizable across individuals (communicating object-centered information; Buresh & Woodward, 2007). In more recent work, results indicate that infants expect novel object labels or signs to be used by multiple individuals, thus generalizable, yet do not expect multiple individuals to have the same preference towards an object (Henderson & Woodward, 2012; Novack et al., 2014). However, other work that excluded all valenced cues indicates that infants do generalize preferences for objects

across individuals (Kampis, Somogyi, Itakura, & Király, 2013).

Liberman et al. (2016) examined infants' expectations of shared food preferences among members of the same group. Results indicated that infants expected members of the same group (e.g., individuals who affiliate with one another or speak the same language) to display the same food preferences (positive affect). Infants also expected dis-preferences (disgust) to extend to all individuals. However, Liberman et al. (2016) found that infants did not expect object (i.e., a bowl) preferences and dis-preferences to be generalizable to other individuals. Although interesting, this finding is in contrast to other generalizability research which has found that preferences for ambiguous objects were generalized across individuals (e.g., Egyed et al., 2013; Gergely et al., 2007). It is possible that the null result from Liberman et al. (2016) in the bowl condition was due to the lack of ambiguity in the stimulus (e.g., an object children have seen before) and that an empty bowl is not inherently disgust-provoking for such an emotional display to be logically directed towards the object. This consideration of the utility of affect in determining generalizability is discussed below.

The Question of Affect

According to the pedagogical approach, if emotions are communicated ostensively then the infant should develop an object-centered interpretation of the emotional display towards a referent (Gergely et al., 2007). Indeed, research has found that ostensively communicated emotions lead to infant expectations of generalizability of both positive and negative emotions, yet, non-ostensively communicated emotions were not generalizable to others (e.g., Egyed et al., 2013).

Though informative, the concept that ostensive communications allow the acquisition of object-centered knowledge is seemingly too simplistic when applied to other topics such as discrete emotions. The concept may be relevant for object labeling and language acquisition but perhaps not entirely accurate for different discrete emotions as they communicate qualitatively different information to the observer about aspects of the relational context (see Chapter 1 for review). Such differential communication may indicate different information about the generalizability of the communication to others as a function of the particular emotion.

Discrete Emotions. The research reviewed above indicates that preferences can be generalized to others (Egyed et al., 2013). In addition, dis-preferences (disgust or dislike) are generalizable across individuals (Egyed et al., 2013; Liberman et al., 2016). A more systematic investigation of the information communicated by positive and negative emotions was examined by Vaish and colleagues (2015). The researchers found that when an experimenter displayed a mixture of disgust-fear toward an ambiguous object (and no emotion toward the non-target object), 2-year-old children generalized the emotional display to a second experimenter who did not display affect toward the object. Children did not generalize when the experimenter displayed joy. Thus, the negative emotion condition communicated object-centered information to the child, whereas the positive emotion condition communicated person-centered information (Vaish et al., 2015).

Other emotions, such as sadness, may be less generalizable across individuals. As mentioned in Chapter 1, sadness has the core-relational theme of irrevocable loss (Lazarus, 1991). Research on children's prosocial responding to others typically involves

an adult displaying sadness or distress at an event (e.g., their drawing is ripped up or they hit their hand with a hammer) and the child is left to respond with little to no prompting (e.g., Svetlova et al., 2010). Around 18-months, infants begin to show prosocial behaviors, such as hugging a sad individual (Zahn-Waxler et al., 1992). These prosocial behaviors are typically directed toward the emoter (sad individual) rather than the referent of the emotional display (ripped drawing or smashed finger). This attention towards the emoter may influence what type of information is communicated to an observer. In contrast to disgust (a referent-centered emotion), sadness may communicate person-centered, or emoter-centered, information.

Current Study

The current study investigated 30-month-olds' behaviors towards objects "tagged" with an affective display from an experimenter (E1) within the context of helping a second experimenter (E2) ignorant of the previous affective display. This study was live acted and closely resembled the ostensive condition in Egyed et al. (2013) with each condition containing separate emotional displays (disgust, sadness, joy) in which E1 displayed one emotion toward one object and neutral affect toward the other object (akin to the Vaish et al., 2015 study). Children in this study were slightly older than the 2-year-old children in the Vaish et al. (2015) study due to the increased complexity of this study (e.g., three conditions with three discrete emotions).

In the disgust condition, I predicted that infants would be more likely to provide E2 with the non-target object, and refrain from interacting with the target object, because this emotional communication was hypothesized to be generalizable to others (e.g., Egyed et al., 2013; Vaish et al., 2015). In the sadness condition, I predicted infants would be more likely to provide E2 with either object since the infant would not have an expectation about E2's preferences or dis-preferences. In the joy condition, I predicted that infants would be more likely to provide the target object to E2 – similar to the results from Egyed et al. (2013) and Vaish et al. (2015). Additionally, I predicted children would more quickly provide E2 with the target object in joy and the distractor object in disgust. I predicted the sadness condition would elicit the longest latency to give times due to the ambiguity of the condition (e.g., the infant would not have an expectation of which object to give).

Methods

Participants

Twenty-two 30-month-old children (16 female; 29.14 - 31.34 months) were recruited from the California Central Valley. This study contained 3 conditions and children participated in all conditions with the three emotional displays randomly presented to each infant. An additional 7 families participated but were excluded due to experimenter error (n = 1), infant inattentiveness (n = 1), or no response from infant in any of the trials (n = 5). Additionally, individual trials were excluded if an infant did not respond during that particular trial (i.e., 1 infant did not respond in the joy condition).

Prior research (Vaish et al., 2015) examining a similar topic reported medium to large effect sizes. An *a priori* power analysis determined that a sample size of at least 24 children, with all children participating in all three conditions, would provide power of .95. However, this estimate should be approached with caution as the prior study did not employ repeated measurements and thus used different analyses.

Most families had an income between $81,000 and $10,000 ($n$ = 5). The total range for income was below $25,000 to above $150,000. Child racial demographics reflected those of the California Central Valley, with parents identifying children as 32% mixed-race, 27% White, 23% Hispanic, 5% Asian, and 13% no answer.

Stimuli

Six ambiguous objects of similar size were placed inside three pairs of containers (two of the same type for each trial; two distinct sets of cans and a set of ball-shaped containers). During the presentation phase, the experimenter opened the container to reveal the smaller object inside (see section below). The colors of each container and accompanying object were distinct and these pairs were held constant across participants and trials. Pilot testing determined there were no differences in children's object preferences or the salience of the objects.

Procedure

The infant and their parent took part in a single lab visit. The primary experimenter (E1) explained the procedures and forms to the parent before the parent gave consent and filled out a consent form, media release form, demographic questionnaire, and emotion expressivity questionnaire. While the parent was filling out these forms, the second experimenter (E2) engaged in reciprocal play with the child for the entirety of the warm up period (i.e., however long it took to have the child engage in reciprocal play with E2 or the end of the consent process, whichever occurred first). E1 gave the parents an overview of the activity, provided instructions so that the parent would not bias their child's behavior during the activity, and answered any parent questions. Next, E1 left to set up the testing room, then returned to the warm up room to lead the parent and infant into the testing room. Instructions were only repeated for a subsequent trial if the parent did not keep the child from engaging with the containers on the first trial or if the parent asked a follow up question.

Presentation phase. E1 directed the parent and infant to be seated in a chair by the back wall of the testing room. The infant was placed on the parent's lap, standing by the parent, or seated on the chair with the parent standing next to them while facing the table. The parent and infant were seated approximately 1 meter in front of a ramp connected to a low table (2' tall). E1 closed a small gate that was next to the table, thus dividing the room in half so that the infant could not go behind the table where the experimenter was. E1 then kneeled on the other side of the table with two opaque containers in front of her (the containers were pre-set on the table; see Figure 2 for a visual depiction of study procedures).

Once everyone was in position, E1 ostensively and neutrally stated, "Look what I have," and opened the left container to reveal the contents. She set down the opened container and left the contents in-between the container and its lid. As the container was set down with the contents revealed, E1 displayed one of three emotions directed at the contents (a small plastic, child-safe toy) of the container: sadness, disgust, or joy (see Table 4 for description of emotional displays). The emotion displays were communicated through the face, voice, and posture, and the duration of each display was around 5 seconds. During this display, E1 pointed toward the contents (visible to the child) and said "[First emotion noise] Look it's a Toma, [second emotion noise] I can't believe it's a Toma." Following the 5-second display, E1 closed the container and turned to the other

container to repeat the same process but with no affect (neutral) and using a different nonsense label (e.g., Fobble). After the second presentation, E1 closed the second container. The ordering of the emotional and neutral displays was counterbalanced across containers/objects.

E1 then left both containers on the table, said, "I am going to leave these here. I am going to go to the other room. Bye!" and exited.

Response phase. Next, E2 entered the room with a "hello" and sat behind the table where E1 was previously. E2 looked at both containers (left to right) as they said, "Look at these!" Then, out of sight from the child, E2 lifted a block of wood from under the ramp apparatus sitting on top of the table to elevate one side of the tray, causing the two containers to roll down the slanted table tray and down to the end of the ramp. E2 exclaimed after the containers stopped rolling, "Uh oh! I can't reach!" while extending her arm toward the midpoint between the two containers at the end of the ramp. She then looked at the infant and asked for help (Prompt 1: "Can you help me?"). This was the cue for the parent to allow their infant to engage with the containers.

The infant had 30 seconds to respond to the helping requests of the experimenter. During the 30 seconds, E2 continued to display that she could not reach the containers by extending her arm toward the middle of the ramp and reaching toward the bottom (but not directly toward either container).

Eliciting help. As E2 reached toward the bottom of the ramp, she went through three prompts (adapted from Svetlova et al., 2010), each spaced 10 seconds apart (a timer at the bottom of the ramp ensured standardized timing).

> Prompt 1: Looking at infant while saying, "Can you help me?"
> Prompt 2: Looking back and forth between the end of the ramp (center) and to the infant while saying, "Can you help me get it?"
> Prompt 3: Looking back and forth again between the end of the ramp (center) and the infant while saying, "I can't reach the can/ball. Can you bring me it?"

E2 was instructed to take the container from the infant only if the infant placed it in the center of the table or in E2's hand. E2 did not orient herself to either side to receive the container.

E1 timed the response phase from outside the room and informed E2 when 30 seconds had elapsed by knocking on the wall and entering the room at which point E2 stopped reaching for the containers. If the child helped and handed a container before the 30 seconds had ended, E2 took the container, said "Ah, here it is" in a neutral tone, and placed it underneath the table. She then knocked on the underside of the table to signal the end of the trial and E1 entered.

Following the response phase, E1 opened the gate and E2 led the parent and infant to the warm up room to start the 10-minute break.

The infant subsequently participated in the presentation and responses phases described above with the two other emotion conditions (E1 and E2 acted out the same roles in each of the trails). Each trial was followed by a 10-minute break during which the experimenters and family played in the warm-up room. Use of a 10-minute break between trials has been used in prior research with younger participants (e.g., Walle et al., 2017) with no carry over effects across emotion conditions. Ordering of the emotion conditions was randomized for each infant, resulting in a within-subjects design.

Figure 2. Events presented during the paradigm for Chapter 5. The top two images depict the presentation phase in a disgust condition with E1 and the bottom two images depict the response phase with E2. Emotion conditions were randomized across participants. The order of emotional and neutral displays toward the containers was counterbalanced across participants.

Table 4.
Descriptions of Emotional Displays

Emotion	Face	Voice	
		First Noise	Second Noise
Disgust	Furrowed eyebrows, scrunched noise, downturned mouth	Sharp sounding "Ewwugh!"	Short "Ughk"
Sadness	Oblique eyebrows, eyes downturned, slumped head	Whiny sounding "Awwww"	Shortened "Aww" noise
Joy	Raised eyebrows with mouth turned upward in smile	High pitched "Oooo"	Short giggle/chuckle noise
Neutral	Neutral resting face with no eyebrow or mouth manipulation	Monotone "Hmmmm"	Monotone "Hm"

Coding

All activities were video recorded with three cameras; one facing the parent and infant, one facing the experimenter, and one positioned above the table facing downward (overhead view of table).

Manipulation check. Two researchers each viewed videos the performance by E1 and E2 in the presentation and response phases, respectively. The first researcher was the primary rater who rated all videos and the second researcher rated 18 of 65 trials (28%). Raters separately rated the emotional display based on the manipulation check procedures described in Walle, Reschke, Camras et al. (2017) and rated the helping display based on the script.

First, the two coders chose from a list of emotions (disgust, fear, joy, neutral, or other) displayed to the left and right container, respectively. Interrater agreement was perfect (100%). Second, coders rated E1's face, voice, and script for each display (emotion, neutral) based on the perceived similarity with a pre-recorded video of the primary experimenter displaying the three emotional expressions and the written scripts. All ratings were on a 3-point scale (1= poor, 2= passable, 3= good). Interrater agreement for E1's displays was very high (90%). Third, coders rated E2's adherence to the helping script. Interrater agreement was also very high (83%). Trials were excluded if the given trial received a rating of 1 in any of the manipulation check categories. Failed attempts at emotional displays (face, voice, script; $n = 1$) or procedures during a given trial ($n = 3$) were excluded.

Response coding. All child response coding was done using the camera angle located above the table or the experimenter facing angle. The coder only watched the response phase portion of the video, and thus could not see or hear the emotion

communicated by E1 in the presentation phase. Additionally, the coders were naïve to the hypotheses and the order of emotion conditions in which the child participated. The primary coder rated all videos with a secondary coder coding 28% of the videos for reliability. Reliability for each categorical code was calculated using Cohen's kappa coefficient for interrater agreement (Cohen, 1960) and the continuous variable of latency used Pearson's r with the mean difference as the measure of interrater agreement. Several trials were excluded because the child touched, grabbed, or gave both objects. The total number of trials included for each emotion condition are also reported below.

First touch. The child's first touch was operationalized as any type of pat, poke, or whole-handed touch of a container. This variable was dichotomous (touch target or touch distractor) for each container (k = .90; $n_{Disgust}$= 20, $n_{Sadness}$= 19, n_{Joy}= 20).

First grab. The child's first grab was operationalized as the first full grasp of a container. This variable was dichotomous (grab target or grab distractor) for each container (k = .91; $n_{Disgust}$= 21, $n_{Sadness}$= 18, n_{Joy}= 20).

First give. The child's first give was operationalized as the container they gave to the experimenter or placed on the table for the experimenter. The variable was dichotomous for each object (give target or give distractor) for each container (k= 1.00; $n_{Disgust}$= 15, $n_{Sadness}$= 16, n_{Joy}= 17).

Latency to give. The child's latency to give was calculated by subtracting the time-stamp of the give time from the time-stamp of the start of the response period (i.e., after E2 finished saying her first helping line). Interrater agreement for coding latency to give was substantial (r = .84, $M_{\text{difference}}$ = 0.05 seconds; $n_{Disgust}$= 21, $n_{Sadness}$= 19, n_{Joy}= 20).

Results

Analytic Strategy

Preliminary analyses did not indicate significant differences between child gender, child ethnicity/race, and parent income on the variables of interest. The binary variables (First Touch, First Grab, First Give) were examined using a Conchran's Q analysis which accounts for more than three groups and repeated measurements. Percentages of children's choosing the target or distractor container (with object inside) in each condition are reported in Table 5. Second, latency to give was examined in a repeated measured ANOVA with each emotion condition as the within-factors variable. Means and standard deviations for each condition are reported in Table 5.

Discrete Emotion

First touch. When examining which container the child first touched, Conchran's Q analysis revealed no significant differences across the three emotion conditions, $\chi^2(2, N = 19) = 3.33$, $p = .19$. This indicates that children did not differentially choose a particular container to give E2 as a function of the emotion displayed by E1.

First grab. Examining which container the infant grabbed first also revealed no significant differences across the three emotion conditions, $\chi^2(2, N = 19) = 2.8$, $p = .25$. Children did not differentially grab the container with the target or neutral object across emotion trials.

First give. Analysis of first container given by the infant revealed no significant differences across the three emotion conditions, $\chi^2(2, N = 10) = 3$, $p = .22$. Again, children were not behaving in a way that was distinct in giving behaviors across trials.

Latency to give. The repeated measures ANOVA of child's latency to give a container revealed a significant result for the Maulchly's test of sphericity, $\chi^2(2) = 13.46$, $p = .001$, and thus there appears to be a violation of sphericity (i.e., unequal variances of the differences between the repeated measurements for the participants). This was corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .62$). When examining the within-subject effects, there was no significant effect of emotion, $F(1.24, 18.56) = 2.03$, $p = .17$, $\eta^2 = .12$. Subsequent pairwise comparisons between emotion conditions were not significant.. Children did not display differences in the length of time it took to give a container across discrete emotion conditions. The observed power for the repeated measures ANOVA was .30

Emotion Valence

The initial discrete emotion results revealed no significant differences. However, the percentages and means reported in Table 5 indicated potential differences across emotional valence. In subsequent set of analyses, I examined differences across emotional valence by comparing negative emotion conditions (disgust and sadness) to the positive emotion condition (joy). A McNemar test analyzed the categorical variables and a dependent (related) samples t-test analyzed the continuous variable of latency to give. Descriptive statistics for valence conditions are also reported in Table 5.

First touch. When examining the differences between valence on first touch, the analysis revealed no significant differences between positive and negative emotion conditions, $\chi^2(1, N = 59) = 1.72$, $p = .19$.

First grab. Examining first grab also revealed no significant differences between positive and negative emotion conditions, $\chi^2(1, N = 51) = 2.56$, $p = .36$.

First give. Differences between valence for first give revealed no significant difference between positive and negative emotion conditions, $\chi^2(1, N = 48) = 0.56$, $p = .45$.

Latency to give. An analysis comparing differences in latency to give a container across valence revealed a significant difference between the positive ($M = 6.44$, $SD = 2.61$) and negative ($M = 12.06$, $SD = 5.71$) emotion conditions, $t(15) = -5.47$, $p < .001$. Children took longer to give in the negative condition than the positive condition.

Table 5.

Percentages of Touch, Grab, and Give Behaviors and Means and Standard Deviations of Latency Across Emotion and Valence

	First Touch		First Grab		First Give		Latency to Give
Variable	Distractor (%)	Target (%)	Distractor (%)	Target (%)	Distractor (%)	Target (%)	*M (SD)*
Emotion							
Joy	35%	65%	35%	65%	35%	65%	6.85 (2.82)
Sadness	63%	35%	67%	33%	69%	31%	8.1 (3.1)
Disgust	65%	35%	57%	43%	67%	33%	9.43 (7.07)
Valence							
Positive	35%	65%	35%	65%	35%	65%	6.85 (2.82)^{N**}
Negative	64%	36%	62%	38%	68%	32%	8.77 (5.52) ^{P**}

Note: Percentages of touching, grabbing, or giving the target or distractor are reported for each emotion and emotional valence. Means and standard deviations are reported for latency to give. Letters next to each latency mean and standard deviation for Positive and Negative Conditions (P = Positive and N = Negative) designate which conditions were significantly different (* = $p < .05$, ** = $p < .01$). For example, 2.5-year-old children gave a container significantly more quickly in the Positive Condition than in the Negative Condition.

Discussion

The current study aimed to identify differences in generalizability across three discrete emotions (joy, sadness, disgust). These emotions communicate distinct relational information (see Chapter 1 for review) and previous research has found that negative emotions communicate object-centered information and are thus generalizable (e.g., Vaish et al., 2015). Results from the current study indicated no differences in generalizability across discrete emotions. Specifically, children's touching, grasping, giving, and latency to respond behaviors did not differ significantly across discrete emotions. Analyses examining valence also found no significant differences between infant touching, grabbing, or giving behaviors. However, there was an effect of valence on latency to give where children in the positive condition tended to give the container to E2 more quickly than when they were in the negative emotion condition. This suggests that children had a harder time deciding which object to give to the second experimenter when the first experimenter expressed a negative emotion toward an object.

These results were largely not in line with the hypotheses. This may be due to the small sample size and power which may have impeded the ability to detect main effects of discrete emotions and valence. Due to the coding, many trials were not used, particularly because the give coding did not consider instances where the child gave both objects to E2 or failed to give either object. Thus, while there appeared to be differences in the descriptive statistics across emotion conditions, these differences were not statistically significant. The analysis of latency to give an object across discrete emotion conditions was also lower in power than the analyses reported by Vaish et al. (2015). This combination of excluded trials and lack of statistical power might have contributed to the null results.

The similarities in behaviors across the disgust and sadness conditions may also indicate that generalizability of preferences elicit only valence-based responses at young ages. For example, children appeared to perform similar behaviors of touching, grabbing, and giving the distractor object over the target object in the negative conditions. Children may not have wanted to inadvertently make the experimenter, who they were previously interacting playing with, sad *or* disgusted, and thus their behaviors were similar across negative conditions. In addition, this similarity of giving a neutral object rather than negatively tagged object could be viewed as a prosocial act toward E2. By giving her the distractor object rather than sad-eliciting object children were ensuring she would not also become sad. Svetlova et al. (2010) found that by two years of age, children start regularly performing prosocial acts in response to sadness. Although I previously suggested that the prosocial actions, such as hugging or giving back a dropped pen, provide evidence for children's allocation of attention to the emoter, children in a different context may display prosociality in a different way. In this study, children were 2.5 years of age and may have used E1's sad display to motivate their subsequent behavior toward E2 in a prosocial manner (e.g., giving the neutral object to E2). Although this is not what I had initially predicted, it makes sense given the increasing prosociality at this age. Conversely, older children may be more adept at overcoming their initial prosocial instincts and using person- and object-centered information to respond to other individuals. Future work can disentangle the discrepancies between the hypotheses and findings through utilizing different paradigms and age groups.

Future Directions

There remain many considerations at the paradigm-level that can be implemented in future investigations. Future generalizability paradigms should have children help an experimenter who is in closer in proximity to promote easier responding for children who are hesitant or shy. Several children did not respond during the activity for all three trials, even with ample warm-up time and interaction with E2. Creating a paradigm where the child is seated at a table on their parents lap with the objects within reach would help the child's hesitancy to respond by having the caregiver close by. Anecdotally, the five children who did not respond across all three trials did not attempt to move off their parents lap even though they were very interested and engaged in the trial. Alternatively, future work can examine children's looking behaviors instead of explicit motor behaviors (e.g., manipulation of an object and moving across a room). A violation-of-expectation paradigm would allow researchers to understand children's, and potentially those younger than 2.5-years-of-age, expectations about the generalizability of emotions. Such paradigm changes would allow researchers to include shy or hesitant children and test younger children.

Future work can also examine the influence of social groups on the generalizability of emotions. Prior research has found that children expect individuals from the same social group to share characteristics and behaviors (e.g., Birnbaum, Deeb, Segall, Ben-Eliyahu, & Diesendruck, 2010; Powell & Spelke, 2013). This concept can be further investigated using a paradigm similar to the current study and manipulating group membership of the experimenters. For instance, two experimenters can be introduced as members of the same or different social group. Then, one experimenter will display an emotion toward one of two objects and the other experimenter will later ask the infant for one of the objects. Children in the same social group condition may expect the experimenters to share the same emotional reaction towards objects and display giving behaviors that indicate the emotion is generalizable. In contrast, experimenters from different social groups may not be perceived as generalizable. However, such responses may depend on the emotion displayed as some emotions (e.g., disgust) may still generalize despite group membership (e.g., Liberman et al., 2016). Future work can also examine how preferences are generalized in contexts during which one individual expresses an emotion toward another individual's action, rather than an object (see Repacholi, Meltzoff, Toub, & Ruba, 2016).

The generalizability of emotions has direct implications for both emotion understanding and emotional responding. Understanding what emotions communicate and how this communication relates to other individuals is important for adaptive social functioning. Disentangling object- or person-centered information communicated by emotions is another step in identifying what specific discrete emotions communicate to an observer.

Chapter 6: General Conclusion

Discrete emotions communicate specific information to the observer about the person-environment relationship. This differential communication may highlight aspects of the relational context as a function of the particular emotion expressed. The studies reported in this dissertation found differences in linguistic focus for elements of emotional contexts (Chapters 2-4) and infant inferences made about others' preferences (Chapter 5). The studies employ convergent methodologies across various age groups to examine the information communicated by discrete emotions and how it influences behavior. In this final chapter, I first discuss how Chapters 2-4 supports prior research and theory, and how Chapter 5 expands the previous chapters to a behavioral paradigm. Second, I discuss the implications for emotion theory and development. Lastly, I describe limitations and pose potential future directions to examine the underlying developmental mechanisms.

I used a picture description methodology to tap into what salient cues individuals focus on when observing discrete emotional contexts. Specifically, adults and parents (Chapters 2 and 3) highlighted the emoter more in sadness and joy than in disgust and fear contexts and highlighted the referent more in disgust, fear, and joy than anger and sadness contexts. Additionally, parents highlighted the emoter more in anger than disgust and fear (Chapter 3). In Chapter 4, older preschool aged children (4.5-year-olds) showed some similar patterns of highlighting these elements, whereas 3.5-year-old children did not. Together, the results provide evidence that discrete emotions do guide our attention toward particular elements of the context as a function of the emotion.

The studies reported in Chapters 2-4 support prior work and the theoretical argument posed in Chapter 1 that discrete emotions communicate different messages to an observer which influences their subsequent behavior (attention, descriptions, behavioral responses). For example, the highlighting of the referent in fear contexts and of the emoter in anger and sadness contexts parallels infants' avoidant behaviors toward fear referents (e.g., Sorce et al., 1985; Walden & Ogan, 1988), prosocial behaviors toward a sad emoter (e.g., Spinrad & Stifter, 2006; Zahn-Waxler et al., 1992), and social avoidance of angry emoters (Walle et al., 2017). Indeed, the heightened attention toward fear referents has also been observed when adults and children are asked to identify the threatening objects in an image (LoBue & DeLoache, 2008). Infants also physically avoid disgusting stimuli (Vaish & Woodward, 2010; Walle, Reschke, Camras et al., 2017) and the results from Chapters 2 and 3 find that adults and caregivers highlight the referent in disgust contexts, though this was not present in preschool-aged children's descriptions (Chapter 4). These findings were extended to a behavioral paradigm in Chapter 5 to provide further support for the relationship between attentional focus and behavior.

The highlighting of elements within discrete emotional contexts may have implications on how emotions generalize to other individuals and subsequent behavior toward other individuals. In Chapter 5, I investigated whether emoter- and referent-centered information provided by different emotions would be generalizable across individuals. I found no significant differences in the generalizability of discrete emotions. There was an effect of emotional valence on latency to give behaviors. Children gave the object more quickly in the joy condition than in the negative emotion conditions. This may suggest that children take longer to process which object to give in the negative

condition. This longer latency time for negative conditions indicated valence differences found in prior work (e.g., Vaish et al., 2015). However, I did not find the differences in generalization across discrete or valence emotion conditions for other behaviors. Taken together, these studies provide evidence that there are important distinctions within discrete emotional communication, though with some caution regarding how differential attention impacts helping behavior in children.

Implications for Emotion Theory and Development

The studies presented in this dissertation provide a window with which to view the differential communications of discrete emotions and provide implications for emotion theory and development. Specifically, the studies help disentangle the discrepancy between basic and constructionist theories of emotion, support the importance of a functional approach, and show the utility in examining discrete emotions.

These studies provide additional evidence for a constructionist approach rather than a basic emotion approach. A constructionist perspective views emotion as developing from an individual's prior experience with a particular emotion (Barrett, 2006). Thus, relational elements (e.g., situations, objects, the emoting individual) play a central role in emotion understanding, as they could provide information that connects with existing conceptions of emotion. In contrast, basic emotions theory contends that facial expressions of emotions are universally expressed and recognized (Ekman, 1993), and thus inclusion of contextual elements should be less important for the understanding of emotions. Chapters 2, 3, and 4 indicate the importance of relational elements, rather than just labeling the emotion, in how individuals talk about emotions. The results in Chapter 4 speak to this debate most directly by providing evidence that children correctly label disgust more often in context images containing relational elements than in face images containing no information other than the emotional face. The differential highlighting of relational elements found in these studies supports the view that contextual cues provide useful information for the observer than the face alone.

Second, the findings provide support for the importance of a functionalist perspective of emotions. The first three studies found that individuals highlight different relational elements in discrete emotion contexts in ways that relate to the function of the emotion being displayed. For instance, in Chapter 3, parents highlight the emoter more in sadness which relates to the function of sadness displays to elicit prosocial responding toward the emoter from an observer (e.g., Campos et al., 1989). Thus, highlighting these particular elements of a relational context is vital in directing an observer's attention and adaptive responses to a situation. Such differential direction of others' attention in emotional contexts is an additional function of discrete emotions. Future work can investigate if this holds for self-descriptions of emotional experiences.

Lastly, it is important for emotion research to move from examining differences between emotional valence (positive vs. negative) and toward examining aspects discrete emotions. In particular, examining different negative emotions allows for the possibility of discovering differences between discrete emotions. Such methods allow researchers to investigate differences between the communicative functions of the discrete emotions and their development. For instance, as seen in Chapter 3, examining valence effects precluded one from observing the important differences between discrete negative emotions, such as the distinction between highlighting the emoter in sadness contexts and

the referent in fear contexts. However, in Chapter 5, children demonstrated a difference across emotional valence but not discrete emotions. Follow-up studies to Chapter 5 could examine differences in ages as the valenced findings may change and become more differentiated throughout development.

Limitations

Although, each study was carefully constructed, there remain limitations to this line of research. Below I discuss the limitations of each paradigm-type and some general limitations for all of the research presented in this dissertation.

Studies using the picture description paradigm have several limitations due to the images used. Great care was taken to ensure that all images in Chapters 2, 3, and 4 (context images only) contained a single emoter displaying a clear emotion towards a common referent. However, images still differed with regards to placement, color, and size of the emoter and referent. Although I controlled for differences in the size of the emoter and referent in the analyses, standardized images are desirable for more fine-grained analyses and studies. I am currently working in collaboration with a researcher at BYU to create more standardized images and future work with this updated picture book will be used to replicate and extend the findings presented in this dissertation.

These studies also require additional replication with non-verbal research methods, such as eye tracking and behavioral responding. More standardized images would allow researchers to examine differences in visual processing of emotional contexts, such as with the use of an eye tracker, and how this processing may differ as a function of the emotion (e.g., Leitzke & Pollak, 2016, see future directions below). In addition, behavioral paradigms can be employed to examine how infants respond to elements of discrete emotions. This will extend the current work to determine if the verbal highlighting of emotional elements maps on to individuals' visual attention and behavioral responding.

Chapters 2-5 also only use a handful of discrete emotions. The emotions used in the studies were five basic emotions that I believed would be the best starting point for my work. However, these studies should be expanded to include additional discrete positive emotions, such as awe, surprise, or pride, and other negative emotions, such as guilt or shame. Future work examining differences between these other discrete emotions will contribute greatly to our understanding of such less studied emotions.

Future Directions

Hartshorne, Tenenbaum, and Pinker (2018) aptly stated that, "science is the process of becoming less wrong..." (pg. 274). The four studies detailed in this dissertation are indicative of this process. The holes that are left unfilled by these studies are ripe for further investigations. Below I detail future research to compliment the studies also help address the limitations described above.

Visual Attention. The linguistic focus on elements of emotions found in Chapters 2-4 is a promising first step into the attentional biases individuals may possess for different emotional contexts. However, a more direct way to test attentional biases would be to use an eye tracker to examine an individual's visual attention toward aspects of an emotional context (e.g., Leitzke & Pollak, 2016). This would entail having more standardized stimuli than in Chapters 2-4 to use in an eye-tracking paradigm. Specifically, the set of stimuli would include images comprised of one emoter displaying

one of five emotions (anger, sadness, disgust, fear, joy) responding to an emotion-congruent referent embedded within a neutral background. This will allow observation of both overall visual processing and specific focus on elements (emoter and referent) of the emotional context. Furthermore, the work in Chapters 3 and 4 provide support for a socialization perspective based on the parallels between parent and older preschooler's descriptions. However, this cannot be concluded from the two separate samples and the verbal nature of the task. The proposed eye-tracking paradigm could test whether young infants display similar patterns of attention to the emoter or referent, and whether such differential attention is the result of innate processing or socialization. Parallels between parents and their child's visual attention in an eye-tracking paradigm would provide evidence for socialization and newborn attention to the same elements, who have little social learning experience, would provide evidence for an innate mechanism. The use of convergent research operations is required to understand the underlying developmental processes of attention toward relational elements.

Memory. An important mechanism, but less often studied, in emotional development is memory. Work by Hertenstein and Campos (2004) provides an excellent step toward uncovering the effects of joy and disgust expressions toward an object on infants' memory and responding. However, there is little work looking at the retention of other discrete emotional communications or how different relational elements might be recalled more accurately than others depending on the emotional display. For instance, one could extend this paradigm to include other emoter-centered emotions, such as sadness, which I predict would not result in a strong retention of the sad-eliciting object. Conversely, an infant witnessing someone's fear of an object may result in retention of the referent so that they can respond adaptively when they encounter that fear-eliciting object in the future. Examining memory for the emoter or referent across discrete emotions would help elucidate how individuals develop their tendency to verbally highlight elements of emotional contexts (as seen in Chapters 2-4) and how children retain and use the emotional information presented to them (as indicated in Chapter 5).

Individual Differences. There are important individual differences in how adults attend to people versus objects when viewing images. For example, individuals who are more physically-oriented tend to focus on objects in images whereas individuals who are more socially-oriented tend to focus on people in images (McIntyre & Graizano, 2016). As such, individuals who are more socially-oriented may initially focus on the emoter of an emotional context whereas those who are physically-oriented may direct their attention to the referent of the image. Research with young children also demonstrates that personal experience with specific emotions influences processing and recollection of emotional contexts (e.g., Pollak et al., 2009). For instance, one individual may find a snake to be a harmless pet and may not allocate more attention toward that stimulus in contrast to someone who encounters snakes in the wild and knows that the particular snake is highly poisonous. Such personal experiences with and preferences for emotion-eliciting stimuli and contexts may lead to differences in how individuals talk about and respond in discrete emotion contexts.

Culture. How individuals display, talk about, and process emotions differs depending on the broader cultural context. Previous research has examined cross-cultural similarities and differences in how individuals process emotions (e.g., Markus &

Kitayama, 1991; Masuda et al., 2008; Matsumoto, Hwang, & Yamada, 2010). Differences in how individuals process emotional contexts may lead to differences in attention toward particular relational elements. For instance, individuals from collectivist cultures have been found to attend more to contextual features when making judgements about the primary emoter (e.g., Matsumoto, Hwang, & Yamada, 2012; Masuda et al., 2008). Such attention may result in different patterns of focus within and across discrete emotions. Furthermore, cultural variation may lead to differences in how individuals talk about, behave toward, attend to elements of emotional context. Future work can examine how these cultural differences manifest in individuals talk about emotions and possible attentional biases when visually processing emotional contexts.

General Summary

The chapters within this dissertation present multiple studies using convergent research operations to examine the communicative functions of discrete emotions. The studies cohere to paint a larger picture of the importance of examining discrete emotions and how such differentiation may develop. This work indicated the utility in examining emotional understanding beyond using facial expressions and emotion labels. Future work can examine broader questions of theoretical importance, such as, the relational phrases used in descriptions, emotions directed at other individuals, and self-experienced emotions. Overall, this program of research has provided a solid foundation for additional projects on this topic, particularly projects involving other methodologies.

References

Adams, S., Kuebli, J., Boyle, P. A., & Fivush, R. (1995). Gender differences in parent-child conversations about past emotions: A longitudinal investigation. *Sex Roles*, *33*, 309-323. doi: 10.1007/BF01954572

Barrett, L. F. (2006). Solving the Emotion Paradox: Categorization and the Experience of Emotion. *Personality and Social Psychology Review*, *10*, 20–46. doi: 10.1207/s15327957pspr1001_2

Barrett, K. C., & Campos, J. J. (1987). Perspectives on emotional development II: A functionalist approach to emotions. In J. Osofsky (Ed.), *Handbook of infant development* (2nd ed., pp. 55-578). New York, NY: Wiley.

Birnbaum, D., Deeb, I., Segall, G., Ben-Eliyahu A., & Diesendruck, G. (2010). The development of social essentialism: The case of Israeli children's inferences about Jews and Arabs. Child Development, 81, 757-777. doi: 10.1111/j.1467-8624.2010.01432.x

Bowlby, J. (1983). *Attachment and Loss: Volume 1: Attachment*. New York, NY: Basic Books.

Brosch, T., Pourtois, G., & Sander, D. (2010). The perception and categorization of emotional stimuli: A review. *Cognition and Emotion, 24,* 377-400. doi: 10.1080/02699930902975754

Brownell, C. A., Svetlova, M., Anderson, R., Nichols, S. R., & Drummond, J. (2013). Socialization of early prosocial behavior: Parents' talk about emotions is associated with sharing and helping in toddlers. *Infancy: The Official Journal of the International Society on Infant Studies*, *18*, 91–119. doi:10.1111/j.1532-7078.2012.00125.x

Buresh, J. S., & Woodward, A. L. (2007). Infants track action goals within and across agents. *Cognition, 104,* 287–314. doi:10.1016/j.cognition.2006.07.001

Campos, J. J., Campos, R. G., Barrett, K. C. (1989). Emergent themes in the study of emotional development and emotion regulation. *Developmental Psychology, 25,* 394-402. doi: 10.1037/0012-1649.25.3.394

Camras, L. (1977). Facial expressions used by children in a conflict situation. *Child Development, 48*(4), 1431-1435. doi:10.2307/1128503

Carver, L. J., & Vaccaro, B. G. (2007). 12-month-old infants allocate increased neural resources to stimuli associated with negative adult emotion. *Developmental Psychology*, *43*, 54-69. doi:10.1037/0012-1649.43.1.54

Ceccarini, F., & Caudek, C. (2013). Anger superiority effect: The importance of dynamic emotional facial expressions. *Visual Cognition, 21*(4), 498-540. doi:10.1080/13506285.2013.807901

Cosmides, L., & Tooby, J. (2000). Evolutionary psychology and the emotions. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of Emotions* (2nd ed.) (pp 91-115). New York: Guilford Press.

Csibra, G. (2010). Recognizing communicative intentions in infancy. *Mind & Language, 25,* 141-168. doi: 10.1111/j.1468-0017.2009.01384.x

Csibra, G. & Gergely, G. (2009) Natural pedagogy. *Trends Cognitive Science, 13*, 148 – 153. doi:10.1016/j.tics. 2009.01.005

Cunningham, M. R. (1988a). Does happiness mean friendliness? Induced mood and heterosexual self-disclosure. *Personality and Social Psychology Bulletin, 14*, 283-297. doi: 10.1177/0146167288142007

Cunningham, M. R. (1988b). What do you do when you're happy or blue? Mood, expectancies, and behavioral interests. *Motivation and Emotion*, *12*, 309-331. doi: 10.1007/BF00992357

Darwin, C. (1872). *The Expression of the Emotions in Man and Animals*, 1st Edn. London: John Murray. doi: 10.1037/10001-000

Deonna & Teroni, (2012). Homing in on the emotions. In Deonna & Teroni, 2012 (Eds.), *The Emotions: A Philosophical Introduction* (pp. 1-13). New York, NY: Routledge.

Denham, S. A. (2006). Social-emotional competence as support for school readiness: What is it and how do we assess it? *Early Education and Development, 17*, 57-89. doi:10.1207/s15566935eed1701_4

Denham, S. A., Zoller, D., & Couchoud, E. A. (1994). Socialization of preschoolers' emotion understanding. *Developmental Psychology, 30,* 928-936. doi: 10.1007/BF00986120

Dewey, J. (1885). The theory of emotion. *Psychological Review, 2*, 13-32. doi: 10.1037/h0070927

de Gelder, B. & Van den Stock, J. (2011). The bodily expressive action stimulus test (BEAST). Construction and validation of a stimulus basis for measuring perception of whole body expression of emotions. *Frontiers in Psychology, 2,* 1-6. doi: 10.3389/fpsyg.2011.00181

Drummond, J., Paul, E. F., Waugh, W. E., Hammond, S. I., & Brownell, C. A. (2014). Here, there and everywhere: Emotion and mental state talk in different social contexts predicts empathic helping in toddlers. *Frontiers in Psychology*, *5*, 1-11. doi: 10.3389/fpsyg.2014.00361

Dunn, J., Bretherton, I., & Munn, P. (1987). Conversations about feeling states between mothers and their young children. *Developmental Psychology, 23*, 132-139. doi: 10.1037/0012-1649.23.1.132

Dunn, J. & Hughes, C. (1998). Young children's understanding of emotions within close relationships. *Cognition & Emotion, 12*, 171-190. doi: 10.1080/026999398379709

Egyed, K., Király, I., & Gergely, G. (2013). Communicating shared knowledge in infancy. *Psychological Science,* 1–6. http://dx.doi.org/ 10.1177/0956797612471952.

Eisenberg, N., Fabes, R. A., Miller, P. A., Fultz, J., Shell, R., Mathy, R. M., & Reno, R. R. (1989). Relation of sympathy and personal distress to prosocial behavior: A multimethod study. *Journal of Personality and Social Psychology, 57,* 55-66. doi: 10.1037/0022-3514.57.1.55

Ekman, P. (1993). Facial expression and emotion. *American Psychologist, 48*, 384-392. doi:10.1037/0003-066X.48.4.384

Ekman, P. (1971). Universals and cultural differences in facial expressions of emotion. In J. Cole (Ed.), *Nebraska Symposium on Motivation* (pp. 207-282). Lincoln, NE: University of Nebraska Press.

Ekman, P., Friesen, W. V., & Ellsworth, P. (1972). *Emotion in the human face: Guidelines for research and an integration of findings.* New York: Pergamon Press.

Farroni, T., Menon, E., Rigato, S., & Johnson, M. H. (2007). The perception of facial expressions in newborns. *European Journal of Developmental Psychology, 4,* 2-13. doi: 10.1080/17405620601046832

Feldman Barrett, L., Lane, R. D. & Schwartz, G. E. (2000). Sex differences in emotional awareness. *Personality and Social Psychology Bulletin, 26*, 1027-1035.doi: 10.1177/01461672002611001

Fessler, D. M. T. (2010). Madmen: An evolutionary perspective on anger and men's violent responses to transgression. In M. Potegal, G. Stemmler, C. Spielberger (Eds.), *International handbook of anger: Constituent and concomitant biological, psychological, and social processes.* (1st ed., pp. 361-381). New York, NY: Springer. doi: 10.1007/978-0-387-89676-2

Fischer, A. H., & Manstead, A. S. R. (2008). Social functions of emotion. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (pp. 456-468). New York, NY, US: Guilford Press.

Fivush, R. (2007). Remembering and reminiscing: How individual lives are constructed in family narratives. *Memory Studies, 1*, 45-54. doi:10.1007/s10615-006-0065-1

Fivush, R. (1989). Exploring sex differences in the emotional content of mother-child conversations about the past. *Sex Roles*, *20*, 675-691. doi: 10.1007/BF00288079

Fivush, R., Brotman, M. A., Buckner, J. P., & Goodman, S. H. (2000). Gender differences in parent-child emotion narratives. *Sex Roles, 42*, 233-253. doi: 10.1023/A:1007091207068

Fredrickson, B. L. (1998). What good are positive emotions? *Review of General Psychology, 2,* 300-319. doi: 10.1037/1089-2680.2.3.300.

Frijda, N. H. (2009). Emotion experience and its varieties. *Emotion Review, 1,* 264-271. doi: 10.1177/1754073909103595

Frijda, N. H. (1986). *The Emotions*. Cambridge, England: Cambridge University Press.

Frijda, N. H., & Mesquita, B. (1994). The social roles and functions of emotions. In S. Kitayama & H. R. Markus (Eds.), *Emotion and culture: Empirical studies of mutual influence* (pp. 51-87). Washington, DC, US: American Psychological Association.

Gable, P. A. & Harmon-Jones, E. (2008). Approach-motivated positive affect reduces breadth of attention. *Psychological Science, 19,* 476-482. doi: 10.1111/j.1467-9280.2008.02112.x

Galperin, A., Fessler, D. M. T., Johnson, K. L. & Haselton, M. G. (2013). Seeing storms behind the clouds: Biases in the attribution of anger. *Evolution and Human Behavior, 34,* 358-365. doi: 10.1016/j.evolhumbehav.2013.06.003

Garner, P. W., Jones, D. C., Gaddy, G., & Rennie, K. M. (1997). Low-income mothers' conversations about emotions and their children's emotional competence. *Social Development, 6*, 37-52. doi:10.1111/j.14679507.1997.tb00093.x

Gergely, G., Egyed, K., & Király, I. (2007). On pedagogy. *Developmental Science, 10*(1), 139-146. doi:10.1111/j.1467-7687.2007. 00576.x

Gordon, R. M. (1974). The aboutness of emotions. *American Philosophical Quarterly, 11,* 27-36.

Hackenbracht, J., & Tamir, M. (2010). Preferences for sadness when eliciting help: Instrumental motives in sadness regulation. *Motivation and Emotion, 34*, 306-315.

Harker, L. & Keltner, D. (2001). Expressions of positive emotion in women's college yearbook pictures and their relationship to personality and life outcomes across adulthood. *Journal of Personality and Social Psychology, 80,* 112-124. doi: 10.1037//0022-3514.80.1.112

Hareli, S. & Hess, U. (2012). The social signal value of emotions. *Cognition and Emotion, 26,* 385-389. doi: 10.1080/02699931.2012.665029

Harshorne, J. K., Tenenbaum, J. B., & Pinker, S. (2018). A critical period for second language acquisition: Evidence from 2/3 million English speakers. *Cognition, 177,* 263-277. doi: 10.1016/j.cognition.2018.04.007

Henderson, A. M. E., & Woodward, A. (2012). Nine-month old infants generalize object labels, but not object preference across individuals. *Developmental Science, 15*(5), 641–665. doi: 10.1111/j.1467-7687.2012.01157.x.

Hertenstein, M. J., & Campos, J. J. (2004). The retention effects of an adult's emotional displays on infant behavior. *Child Development, 75*, 595-613. doi:10.1111/j.1467-8624.2004.00695.x

Hobson, P. (1998). The emotional origins of social understanding. *Philosophical Psychology, 6*, 227-249. doi: 10.1080/09515089308573090

Hornik, R., Risenhoover, N., & Gunnar, M. (1987). The effects of maternal positive, neutral, and negative affective communications on infant responses to new toys. *Child Development, 58*, 937-944.

Juth, J. Lundqvist, D., Karlsson, A., & Ohman, A. (2005). Looking for foes and friends: Perceptual and emotional factors when finding a face in the crowd. *Emotion, 5,* 379-395. doi: 10.1037/1528-3542.5.4.379

Kampis, D., Somogyi, E., Itakura, S. & Király, I. (2013). Do infants bind mental states to agents?
Cognition, 129(2), 232-40. doi: 10.1016/j.cognition.2013.07.004.

Keating, C. F., Mazur, A., & Segall, M. H. (1981). A cross-cultural exploration of physiognomic traits of dominance and happiness. *Ethology and Sociobiology, 2,* 41-48. doi: 10.1016/0162-3095(81)90021-2

Keltner, D., & Haidt, J. (1999). Social functions of emotions at four levels of analysis. *Cognition and Emotion, 13*, 505-521. doi: 10.1080/026999399379168

Klinnert, M. D., Campos, J. J., Sorce, J. F., Emde, R. N., & Svejda, M. (1983). Emotions as behavior regulators: Social referencing in infancy. In R. Plutchik & H. Kellerman (Eds.), *Emotions: Theory, research, and experience* (Vol. 2, pp. 57-86). New York: Academic Press.

Knutson (1996). Facial expressions of emotion influence interpersonal trait inferences. *Journal of Nonverbal Behavior, 20*, 165-182. doi: 10.1007/BF02281954

Kuebli, J., & Fivush, R. (1992). Gender differences in parent-child conversations about past emotions. *Sex Roles*, *27*, 683-698. doi: 10.1007/BF01954572

LaBounty, J., Wellman, H. M., Olson, S., Lagattuta, K., & Liu, D. (2008). Mothers' and fathers' use of internal state talk with their young children. *Social Development, 17*, 757-775. doi:10.1111/j.1467-9507.2007.00450.x

Lagattuta, K. H. & Wellman, H. M. (2002). Differences in early parent-child conversations about negative versus positive emotions: Implications for the development of psychological understanding. *Developmental Psychology*, *38*, 564-580. doi:10.1037/0012-1649.38.4.564

Lazarus, R. (1991). *Emotion and Adaptation*. New York, NY: Oxford University Press.

Leitzke, B. T. & Pollak, S. D. (2016). Developmental changes in the primacy of facial cues for emotion recognition. *Developmental Psychology, 52,* 572-581. doi: 10.1037/a0040067

Levenson, R. W. (1992). Autonomic nervous system differences among emotions. *Psychological Science, 3*, 23-27. doi: 10.1111/j.1467-9280.1992.tb00251.x

Liberman, Z., Woodward, A. L., Sullivan, K. R., & Kinzler, K. D. (2016). Early emerging system for reasoning about the social nature of food. *PNAS, 113*(34), 9480-9485. doi:10.1073/pnas.1605456113

LoBue, V. & DeLoache, J. S. (2008). Detecting the snake in the grass: Attention to fear-relevant stimuli by adults and young children. *Psychological Sciences, 19,* 284-289. doi: 10.1111/j.1467-9280.2008.02081.x.

LoBue, V. & Thrasher, C. (2015). The Child Affective Facial Expression (CAFÉ) set: Validity and reliability from untrained adults. *Frontiers in Psychology, 5,* 1-8. doi: 10.3389/fpsyg.2014.01532

Lopez, L. D., Reschke, P. J., Knothe, J. M., & Walle, E. A. (2017). Postural communication of emotion: Perception of distinct poses for five discrete emotions. *Frontiers in Psychology, 8*, 710. doi: 10.3389/fpsyg.2017.00710

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*, 803-855. doi:10.1037/0033-2909.131.6.803

March, D. S., Gaertner, L., & Olson, M. A. (2017). In Harm's way: On preferential response to threatening stimuli. *Personality and Social Psychology Bulletin, 43*, 1519-1529. doi:10.1177/0146167217722558

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. Psychological Review, 98, 224-253. doi:10.1037/0033-295X.98.2.224

Masuda, T., Ellsworth, P. C., Mesquita, B., Leu, J., Tanida, S., & Van de Veerdonk, E. (2008). Placing the face in context: cultural differences in the perception of facial emotion. Journal of personality and social psychology, 94, 365. doi: 10.1037/0022-3514.94.3.365.

Matsumoto, D., Hwang, H. S., & Yamada, H. (2010). Cultural differences in the relative contributions of face and context to judgments of emotions. *Journal of Cross-Cultural Psychology, 43,* 198-218. doi: 10.1177/0022022110387426

Matsumoto, D., Hwang, H. S., Yamada, H. (2012). Differences in the relative contributions of face and context to judgements of emotions. *Journal of Cross-Cultural Psychology, 43,* 198-218. doi: 10.1177/0022022110387426

McIntyre, M. M., & Graziano, W. G. (2016). Seeing people, seeing things: Individual differences in selective attention. *Personality and Social Psychology Bulletin, 42,* 1258-1271. doi: 10.1177/0146167216653937

McRae, K. Ochsner, K. N., Mauss, I. B., Gabrieli, J. J. D., & Gross, J. J. (2008). Gender differences in emotion regulation: An fMRI study of cognitive reappraisal. *Group Processes and Intergroup Regulations, 11*, 143-162. doi: 10.1177/1368430207088035

Mineka, S., & Cook, M. (1993). Mechanisms involved in the observational conditioning of fear. *Journal of Experimental Psychology: General, 122*, 23-38. doi:10.1037/0096-3445.122.1.23

Mumenthaler, C., & Sander, D. (2012). Social appraisal influences recognition of emotions. Journal of Personality and Social Psychology, 102, 1118-1135. doi: 10.1037/a0026885

Nelson, A. J., Adams Jr., R. B., Stevenson, M. T., Weisbuch, M., & Norton, M. I. (2013). Approach-avoidance movement influences the decoding of anger and fear expressions. *Social Cognition*, *31*(6), 745-757. doi: 10.1521/soco.2013.31.6.745

Novack, M. A., Henderson, A. M. E., & Woodward, A. L. (2014). Twelve-month-old infants generalize novel signed labels, but not preferences across individuals. *Journal of Cognition and Development, 15,* 539-550. doi: 10.1080/15248372.2013.782460

Oaten, M., Stevenson, R. J., & Case, T. I. (2009). Disgust as a disease-avoidance mechanism. Psychological Bulletin, 135, 303-321. doi:10.1037/a0014823

Öhman, A., & Mineka, S. (2001). Fear, phobias and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review*, *108*, 483–522. doi: 10.1037//0033-295X.108.3.483

Parkinson, B., Fischer, A., & Manstead, A. S. R. (2005). *Emotion in social relations: Cultural, group, and interpersonal processes.* New York: Psychology Press.

Pennebaker, J. W., Mehl, M. R., & Niederhoffer, K. G. (2003). Psychological aspects of natural language use: Our words, our selves. *Annual Review of Psychology, 54,* 547-577. doi: 10.1146/annurev.psych.54.101601.145041

Pollak, S. D., Messner, M., Kistler, D. J., & Cohn, J. F. (2009). Development of perceptual expertise in emotion recognition. *Cognition, 110,* 242-247. doi: 10.1016/j.cognition.2008.10.010

Pool, E., Brosch, T., Delplanque, S., & Sander, D. (2016). Attentional bias for positive emotional stimuli: A meta-analytic investigation. *Psychological Bulletin, 142*, 79-106. doi:10.1037/bul0000026

Powell, L. J., & Spelke, E. S. (2013). Preverbal infants expect members of social groups to act alike. *Proceedings of the National Academy of Sciences, 110,* E3965-E3972. doi: 10.1073/pnas.1304326110

Racine, T. P., Carpendale, J. I. M., & Turnbull, W. (2007). Parent–child talk and children's understanding of beliefs and emotions. *Cognition and Emotion, 21*, 480-494. doi:10.1080/02699930600717599

Repacholi, B. M., Meltzoff, A. N., & Olsen, B. (2008). Infants' understanding of the link between visual perception and emotion: "If she can't see me doing it, she won't

get angry." Developmental Psychology, 44, 561–574. doi:10.1037/0012-1649.44.2.561

Repacholi, B. M., Meltzoff, A. N., Toub, T. S., & Ruba, A. L. (2016). Infants' generalization about other people's emotions: Foundations for trait-like attributions. *Developmental Psychology, 52,* 364-378. doi: 10.1037/dev0000097

Reschke, P. J., Walle, E. A., Knothe, J. M., & Lopez, L. D. (2019). The influence of context on distinct facial expressions of disgust. *Emotion, 19*, 365-370. doi: 10.1037/emo0000445

Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review, 94*, 23-41. doi:10.1037/0033-295X.94.1.23

Rozin, P., Lowery, L., & Ebert, R. (1994). Varieties of disgust faces and the structure of disgust. *Journal of Personality and Social Psychology, 66*, 870-881. doi: 10.1037/0022-3514.66.5.870

Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology, 50*, 703-712. doi:10.1037/0022-3514.50.4.703

Rubenking, B. and Lang, A. (2014), Captivated and grossed out: An examination of processing core and sociomoral disgusts in entertainment media. *Journal of Communication, 64*, 543-565. doi:_10.1111/jcom.12094

Ruffman, T., Slade, L., & Crowe, E. (2002), The relation between children's and mothers' mental state language and theory-of-mind understanding. *Child Development, 73*, 734–751.

Savage, R. A., Becker, S. I., & Lipp, O. V. (2016). Visual search for emotional expressions: Effect of stimulus set on anger and happiness superiority. *Cognition and Emotion, 30*, 713-730. doi:10.1080/02699931.2015.1027663

Sawchuk, C. N., Lohr, J. M., Tolin, D. F., Lee, T. C., & Kleinknecht, R. A. (2000). Disgust sensitivity and contamination fears in spider and blood–injection–injury phobias. *Behaviour Research and Therapy, 38*, 753-762. doi:10.1016/S0005-7967(99)00093-5

Schmidt, L. J., Belopolsky, A. V., & Theeuwes, J. (2015). Attentional capture by signals of threat. *Cognition and Emotion, 29*, 687-694. doi:10.1080/02699931.2014.924484

Sorce, J. F., Emde, R., N., Campos, J., & Klinnert, M. D. (1985). Maternal emotional signaling: Its effect on the visual cliff behavior of 1-year-olds. *Developmental Psychology, 21*, 195-200. doi: 10.1037/0012-1649.21.1.195

Spinrad, T. L., & Stifter, C. A. (2006). Toddlers' empathy-related responding to distress: Predictions from negative emotionality and maternal behavior in infancy. *Infancy, 10*, 97-121. doi:10.1207/s15327078in1002_1

Stevenson, R. J., Oaten, M. J., Case, T. I., Repacholi, B. M., & Wagland, P. (2010). Children's response to adult disgust elicitors: Development and acquisition. Developmental Psychology, 46, 165-177. doi:10.1037/a0016692

Stocks, E. L., Lishner,D. A., & Decker, S. K. (2009). Altruism or psychological escape: Why does empathy promote prosocial behavior? *European Journal of Social Psychology, 39*, 649-665. doi: 10.1002/ejsp.561

Strayer, J. (1980). A naturalistic study of empathic behaviors and their relation to affective States and perspective-taking skills in preschool children. *Child Development, 51*, 815-822. doi:10.2307/1129469

Svetlova, M., Nichols, S. R., & Brownell, C. A. (2010). Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Development, 81*(6), 1814-1827. doi:10.1111/j.1467-8624.2010.01512.x

Thompson, R. A. (2006). Conversation and developing understanding: Introduction to the special issue. *Merrill-Palmer Quarterly,* 52, 1-16. Wayne State University Press.

Tomasello, M. (2008). *Origins of human communication*. Cambridge, MA: MIT Press.

Vaish, A., Grossman, T., & Woodward, A. (2015). Person-centered positive emotions, object centered negative emotions: 2-year-olds generalize negative but not positive emotions across individuals. *British Journal of Developmental Psychology, 33*, 391-397. doi:10.1111/bjdp.12093

Vaish, A., & Woodward, A. (2010). Infants use attention but not emotion to predict others' actions. Infant Behavior and Development, 33, 79–87. doi:10.1016/j.infbeh.2009.11.003

Walden, T., & Ogan, T. (1988). The development of social referencing. *Child Development, 59*, 1230-1240. doi: 10.2307/1130486

Walle, E. A., & Campos, J. J. (2012). Interpersonal responding to discrete emotions: A functionalist approach to the development of affect specificity. Emotion Review, 4, 413-422. doi:10.1177/1754073912445812

Walle, E. A., Reschke, P. J., Camras, L. A., & Campos, J. J. (2017). Infant differential behavioral responding to discrete emotions. Emotion. doi: 10.1037/emo0000307

Walle, E. A., Reschke, P. J., & Knothe, J. M. (2017). Social referencing: Defining and delineating a basic process of emotion. *Emotion Review, 9*, 245-252. doi: 10.1177/1754073916669594

Widen, S. C. (2013). Children's interpretation of facial expressions: The long path from valence based to specific discrete categories. *Emotion Review, 5,* 72-77. doi: 10.1177/1754073912451492

Widen, S. C. & Russell, J. A. (2003). A closer look at preschoolers' freely produced labels for facial expressions. *Developmental Psychology, 39,* 114-128. doi: 10.1037/0012-1649.39.1.114

Widen, S. C., & Russell, J. A. (2008). Children acquire emotion categories gradually. *Cognitive Development, 23,* 291-312. doi: 10.1016/j.cogdev.2008.01.002

Widen, S. C., & Russell, J. A. (2010a). Differentiation in preschooler's categories for emotion. *Emotion*, *10,* 651–661. doi: 10.1037/a0019005

Widen, S. C., & Russell, J. A. (2010b). Children's scripts for social emotions: Causes and consequences are more central than are facial expressions. *British Journal of Developmental Psychology, 28*, 565–581. doi: 10.1348/026151009X457550d.

Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. *Developmental Psychology, 28*, 126-136. doi:10.1037/0012- 1649.28.1.126.

Appendix A

Descriptions of each image included in the image description activity reported in Chapter 2

	Emoter Gender	
Image Emotion	Male	Female
Anger	A man is seated at a desk with his hands raised in frustration. His angry face is directed toward the computer on the desk. There is a keyboard and other office supplies on his desk. Image captures the tabletop and the upper portion of the man. The background is off-white.	A woman is in bed and her right arm is raised into a first directed toward an alarm clock next to the bed. Her angry face is directed toward the alarm clock. The image captures the woman's upper body. The background is white.
Sadness	A man is sitting on an outside bench with a box of office supplies. His face is expressing sadness and directed the right side of the screen and is resting on his right hand. The man has a briefcase next to him. The image captures the full body of the man with the exception of his feed. The background is white.	A woman is holding a tissue to her eye with her right hand. Her other hand holds a picture frame with the image facing her. Her face expressing sadness with a downturned mouth and furrowed brow. The image captures her shoulders to the top of her head. The background is a neutral out-of-focus room.
Disgust	A man is holding a fork with three brussels sprouts on the fork prongs. His right hand is holding the form away from himself. His disgusted face is directed	A woman is holding a cup of milk away from her face with her left hand. Her disgusted face is directed toward the cup that she is holding. The image captures the upper body of the woman and has a grey background.

	toward the food. The image captures the man's upper torso to his forehead. The background is white.	
Fear	A man is in a park and leaning away from a goose advancing toward him. His arms are pulled back defensively with his right leg sticking out as if to kick the goose. The goose is on the left of the image. The background includes grass in the foreground, and trees and buildings in the distance.	A woman is on a chair backing away with mouth open. Her right hand is in the air and her left arm clutches a few files. Her fearful face is directed toward a rat on the floor in the bottom left of the image. The image completely captures the woman crouching on the chair and has a white background.
Joy	A man is holding a check with both hands. His happy face is directed toward the camera. The image captures the man's torso and above. The background is white.	A woman is holding car keys in her right hand and giving a thumbs up with her left hand. She is seated in a car. Her body and face are directed toward the camera with a clear smile. The background is an out-of-focus car window frame and car body.

Appendix B

Table B1.

Mixed Model for Total Words reported in Chapter 2

Parameter	*b*	*SE*	*t*	*p*-value	95% Confidence Interval Lower Bound	Upper Bound
Intercept	3.71	0.07	57.04	< .001	3.58	3.84
Anger	-0.03	0.03	-0.98	.328	-0.07	0.03
Sadness	-0.04	0.03	-1.56	.118	-0.09	0.01
Joy	-0.12	0.03	-4.53	< .001	-0.17	-0.07
Disgust	-0.10	0.03	-3.82	< .001	-0.15	-0.05
Fear	0					
Participant Gender	0.19	0.08	2.32	.021	0.03	0.35
Control Variables						
Trial	0.012	0.03	4.29	< .001	0.01	0.02

Table B2.
Mixed Model for Mentioning the Emoter reported in Chapter 2

Parameter	*b*	*SE*	*t*	*p*-value	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Intercept	0.71	0.06	11.45	< .001	0.59	0.83
Anger	0.08	0.04	1.99	.047	0.001	0.15
Sadness	0.25	0.04	6.58	< .001	0.18	0.33
Joy	0.31	0.04	8.44	< .001	0.23	0.38
Disgust	0.01	0.05	0.21	.834	-0.09	0.11
Fear	0					
Participant Gender	-0.07	0.04	-1.55	.123	-0.15	0.02
Control Variables						
Trial	-0.001	0.004	-0.32	.751	-0.01	0.01
Total Words	0.02	0.001	23.24	< .001	0.02	0.02
Emoter Size	< 0.001	0.001	0.07	.943	-0.001	0.001

Table B3.
Mixed Model for Mentioning the Referent reported in Chapter 2

Parameter	*b*	*SE*	*t*	*p*-value	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Intercept	0.19	0.09	2.19	.029	0.02	0.35
Anger	-0.41	0.09	-4.51	< .001	-0.59	-0.23
Sadness	-0.60	0.10	-6.11	< .001	-0.79	-0.41
Joy	0.02	0.05	0.38	.707	-0.08	0.12
Disgust	0.28	0.05	6.05	< .001	0.187	0.367
Fear	0					
Participant Gender	-0.08	0.05	-1.65	.099	-0.18	0.02
Control Variables						
Trial	0.01	0.01	2.04	.041	< 0.001	0.02
Total Words	0.02	0.001	15.89	< .001	0.02	0.02
Referent Size	0.01	0.003	2.38	.017	0.001	0.013

Table B4.
Mixed Model for Labeling the Emotion reported in Chapter 2

Parameter	*b*	*SE*	*t*	*p*-value	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Intercept	0.50	0.11	4.71	< .001	0.29	0.70
Anger	-0.06	0.06	-1.00	.324	-0.18	0.06
Sadness	-0.49	0.07	-7.00	< .001	-0.63	-0.35
Joy	-0.18	0.06	-2.73	.006	-0.30	-0.05
Disgust	-0.47	0.07	-6.69	< .001	-0.61	-0.33
Fear	0					
Participant Gender	-0.02	0.08	-0.19	.848	-0.17	0.14
Control Variables						
Trial	-0.01	0.01	-0.67	.51	-0.02	0.01
Total Words	0.01	0.002	2.96	.003	0.002	0.01

Appendix C

Descriptions of each image included in the picture book activity reported in Chapter 3

	Child Emoter Gender	
Image Emotion	Male	Female
Anger	Boy seated at a table with his left hand holding his head up and his elbow on the table. His angry face is directed toward the camera. There is a book in front of him and his right hand holds a pencil. Image captures the tabletop and the upper portion of the child. The background is white.	Girl has both hands on her hips and is standing behind a large suitcase. Her angry face is directed toward the camera. The image captures the girl's full body. The background is white.
Sadness	Boy at amusement park. His face is expressing sadness and directed towards his hands that hold an empty ice cream cone. The dropped ice cream is located in front of his right foot in the bottom left of the image. The image captures the full body of the boy and an out of focus rollercoaster is in the background.	Girl is holding a phone to her ear with her right hand. Her face is downcast and expressing sadness. The image captures her shoulders to the top of her head. The background is white.
Disgust	Boy is holding a green smoothie away from himself with his right hand. His disgusted face is	Girl is holding a broccoli floret in front of her face with her right hand. Her disgusted face is directed toward the broccoli floret that she is holding. She is

	directed toward the drink. The image captures the boy from the waist up. The background is white.	seated at a table that holds a plate of broccoli. The image captures the table and the upper body of the child.
Fear	Boy in a sparsely decorated room standing on a chair against a wall. His hands are on either side of his face, which is expressing fear toward a Great Dane dog near his feet. The dog is gazing at the child's face in a non-aggressive manner. The dog is located near the middle of the image and the boy is to the left of the dog.	Girl is backing away with mouth open. Her fearful face is directed toward a spider held by a pair of hands coming off the right of the image. The image captures the girl above the torso and the entire spider. The background is white.
Joy	Boy holding a present with both hands. His right hand is hidden behind the box. His happy face is directed toward the camera. The image captures the child's torso and above. The background is white.	Girl holding a puppy. She is kneeling down with her arms around the puppy. Her body and face are directed toward the camera with a clear smile. The image captures the entire body of the girl and puppy. The background is an out-of-focus room.

Appendix D

Table D1.

Mixed Model for Parent Words from Chapter 3

Parameter	*b*	*SE*	*p*-value	95% Confidence Interval Lower Bound	Upper Bound
Intercept	18.03	21.71	.41	-26.17	62.24
Anger	-2.20	2.00	.27	-6.13	1.74
Sadness	1.68	2.01	.40	-2.27	5.63
Joy	-4.89	2.02	.016	-8.86	-0.92
Disgust	-0.38	2.00	.85	-4.32	3.56
Fear	0	0			
Infant Gender	0.10	5.05	.98	-10.39	10.19
Control Variables					
Trial	-0.16	0.23	.49	-0.60	0.29
Language Spoken	-2.20	5.48	.69	-13.36	8.59
Infant Age	0.53	0.93	.57	-1.36	2.42
Family Income	1.76	1.65	.30	-1.61	5.12

Table D2.
Mixed Model for Parent Mentioning the Emoter from Chapter 3

				95% Confidence Interval	
Parameter	*b*	*SE*	*p*-value	Lower Bound	Upper Bound
Intercept	0.68	1.46	.64	-2.29	3.66
Anger	2.81	0.31	< .001	2.21	3.41
Sadness	2.40	0.29	< .001	1.83	2.98
Joy	1.24	0.29	< .001	0.67	1.82
Disgust	1.10	0.30	< .001	0.52	1.70
Fear	0	0			
Infant Gender	0.47	0.33	.16	-1.15	0.21
Control Variables					
Trial	-0.06	0.03	.06	-0.13	0.002
Parent Words	0.10	0.01	< .001	0.08	0.11
Emoter Size	0.005	0.002	.002	0.002	0.01
Language Spoken	0.06	0.36	.87	-0.68	0.80
Infant Age	-0.07	0.06	.29	-0.19	0.06
Family Income	0.11	0.11	.34	-0.12	0.33

Table D3.
Mixed Model for Parent Mentioning the Referent from Chapter 3

				95% Confidence Interval	
Parameter	*b*	*SE*	*p*-value	Lower Bound	Upper Bound
Intercept	0.32	0.82	.70	-1.33	1.96
Anger	-2.07	0.28	< .001	-2.62	-1.53
Sadness	-1.74	0.38	< .001	-2.47	-1.01
Joy	-0.01	0.29	.99	-0.58	0.57
Disgust	-0.60	0.33	.07	-1.24	0.05
Fear	0	0			
Infant Gender	0.08	0.17	.98	-0.34	0.35
Control Variables					
Trial	0.01	0.03	.66	-0.05	0.07
Parent Words	0.08	0.005	< .001	0.07	0.09
Referent Size	-0.01	0.003	.01	-0.01	-0.001
Language Spoken	0.28	0.18	.13	-0.09	0.66
Infant Age	0.06	0.03	.06	-0.004	0.12
Family Income	-0.04	0.06	.49	-0.15	0.07

Table D4.
Mixed Model for Parent Labeling the Emotion from Chapter 3

Parameter	*b*	*SE*	*p*-value	95% Confidence Interval Lower Bound	Upper Bound
Intercept	1.32	1.19	.28	-1.10	3.73
Anger	.40	0.20	.048	0.004	0.80
Sadness	0.19	0.20	.34	-0.21	0.59
Joy	-0.24	0.20	.24	-0.64	0.16
Disgust	0.35	0.20	.09	-0.05	0.75
Fear	0	0			
Infant Gender	0.51	0.27	.07	-1.07	0.04
Control Variables					
Trial	-0.02	0.02	.34	-0.07	0.02
Parent Words	0.03	.27	< .001	-0.02	0.04
Language Spoken	0.46	0.30	.13	-0.14	1.07
Infant Age	-0.04	0.05	.45	-0.14	0.06
Family Income	0.02	0.09	.82	-0.16	0.20

Table D5.
Mixed Model for Parent Questions from Chapter 3

Parameter	*b*	*SE*	*p*-value	95% Confidence Interval Lower Bound	Upper Bound
Intercept	-1.77	1.59	.28	-5.00	1.47
Anger	0.08	0.24	.74	-0.40	0.56
Sadness	-0.08	0.24	.75	-0.56	0.40
Joy	0.36	0.25	.15	-0.13	0.85
Disgust	0.15	0.24	.52	-0.32	0.64
Fear	0	0			
Infant Gender	0.88	0.37	.02	-1.63	-0.13
Control Variables					
Trial	-0.005	0.03	.87	-0.06	0.05
Parent Words	0.07	.006	< .001	0.06	0.08
Language Spoken	0.21	.40	.60	-0.61	1.04
Infant Age	0.07	0.07	.34	-0.07	0.20
Family Income	0.09	0.12	.56	-0.16	0.34

Appendix E

Table of leading parent utterances across all trials from Chapter 4

Variables	Frequency of Leading Utterances	Total number of trials	Percent of Leading Utterances
Total Trials	193	666	29.3%
Child Age			
3.5 years	75	318	23.6%
4.5 years	118	348	33.9%
Income			
Less than $25,000	34	129	26.4%
Between $25,000 and 40,000	39	125	31.2%
Between $41,000 and 60,000	32	119	26.9%
Between $61,000 and 80,000	16	70	22.9%
Between $81,000 and 100,000	45	120	37.5%
Between $101,000 and 120,000	18	59	30.5%
Between $121,000 and 150,000	0	15	0.0%
Above $150,000	9	29	31.0%
Race/Ethnicity			
Caucasian/White	58	253	22.9%
Hispanic	50	173	28.9%
Mixed Race/Ethnicity	71	225	31.6%

Appendix F

Table F1.

Mixed Model for Emotion Labels for 3.5-Year-Olds from Chapter 4

					95% Confidence Interval	
Parameter	*b*	*SE*	*t*	*p*-value	Lower Bound	Upper Bound
Intercept	-1.59	0.73	-2.18	.030	-3.03	-0.15
Anger	1.04	0.47	2.24	.026	0.13	1.96
Sadness	0.69	0.44	1.57	.118	-0.18	1.56
Disgust	-1.29	0.54	-2.38	.018	-2.35	-0.22
Fear	-1.11	0.50	-2.24	.026	-2.09	-0.13
Joy	0					
Face Image	0.63	0.82	0.76	.45	-0.99	2.24
Context Image	0					
Picture Emotion x Picture Type						
Anger x Face Image	-1.37	0.78	-1.75	.08	-2.92	0.17
Anger x Context Image	0					
Sadness x Face Image	0.02	0.92	0.03	.98	-1.78	1.83
Sadness x Context Image	0					
Disgust x Face Image	-1.03	0.90	-1.15	.25	-2.79	0.73
Disgust x Context Image	0					
Fear x Face Image	-0.47	0.85	-0.56	.58	-2.15	1.23
Fear x Context Image	0					
Joy x Face Image	0					
Joy x Context Image	0					
Control Variables						
Trial	0.02	0.05	0.42	.49	-0.60	0.29
Child Gender	0.04	0.02	2.45	.02	0.01	0.08
On Task Child Words	0.04	0.02	2.45	.02	0.01	0.08
Emoter Size	0.01	0.003	1.96	.05	-0.00	0.01

Table F2.
Mixed Model for Mentioning the Emoter for 3.5-Year-Olds from Chapter 4

					95% Confidence Interval	
Parameter	*b*	*SE*	*t*	*p*-value	Lower Bound	Upper Bound
Intercept	0.21	0.45	0.46	.64	-0.673	1.09
Anger	0.24	0.29	0.83	.41	-0.33	0.81
Sadness	0.08	0.28	0.29	.41	-0.33	0.81
Disgust	-0.14	0.28	-0.49	.63	-0.69	0.42
Fear	-0.27	0.28	-0.98	.33	-0.82	0.28
Joy	0					
Control Variables						
Trial	-0.003	0.03	-0.11	.91	-0.06	0.06
Child Gender	0.15	0.28	0.54	.59	-0.40	0.70
On Task Child Words	0.14	0.01	12.27	<.001	0.12	0.16
Emoter Size	-0.001	0.002	-0.51	.61	-0.00	0.002

Table F3.

Mixed Model for Mentioning the Referent for 3.5-Year-olds from Chapter 4

					95% Confidence Interval	
Parameter	*b*	*SE*	*t*	*p*-value	Lower Bound	Upper Bound
Intercept	0.55	0.42	1.29	.20	-0.29	1.38
Anger	-0.51	0.23	-2.20	.03	-0.96	-0.05
Sadness	-0.25	0.33	-0.75	.45	-0.90	0.40
Disgust	-0.17	0.29	-0.59	.56	-0.74	0.40
Fear	0.07	0.22	0.32	.75	-0.37	0.51
Joy	0					
Control Variables						
Trial	-0.002	0.02	-0.09	.93	-0.05	0.04
On Task Child Words	0.08	0.01	11	< .001	0.07	0.10
Child Gender	0.18	0.16	1.11	.27	-0.14	0.49
Referent Size	< 0.001	0.002	0.16	.87	-0.004	0.005

Table F4.
Mixed Model for Emotion Labels for 4.5-Year-Olds from Chapter 4

					95% Confidence Interval	
Parameter	*b*	*SE*	*t*	*p*-value	Lower Bound	Upper Bound
Intercept	0.07	0.79	0.08	.933	-1.48	1.62
Anger	0.32	0.50	0.004	.997	-0.09	0.10
Sadness	0.51	0.49	1.04	.299	-0.46	1.47
Disgust	-1.46	0.48	-3.08	.002	-2.40	-0.53
Fear	-1.49	0.50	-3.27	.001	-2.38	-0.59
Joy	0					
Face Image	0.61	0.95	0.64	.524	-1.27	2.48
Context Image	0					
Picture Emotion x Picture Type						
Anger x Face Image	0.55	1.30	0.43	.669	-1.99	3.10
Anger x Context Image	0					
Sadness x Face Image	-0.91	1.06	-0.85	.394	-3.00	1.18
Sadness x Context Image	0					
Disgust x Face Image	-2.11	1.00	-2.11	.035	-4.07	-0.15
Disgust x Context Image	0					
Fear x Face Image	0.14	0.96	0.14	.887	-1.76	2.03
Fear x Context Image	0					
Joy x Face Image	0					
Joy x Context Image	0					
Control Variables						
Trial	< 0.001	0.05	0.004	1.00	-0.10	0.10
Child Gender	-0.25	0.36	-0.69	.492	-0.95	0.46
On Task Child Words	0.03	0.01	2.26	.025	0.004	0.06
Emoter Size	0.01	0.003	2.04	.042	< 0.001	0.01

Table F5.

Mixed Model for Mentioning the Emoter for 4.5-Year-olds from Chapter 4

					95% Confidence Interval	
Parameter	*b*	*SE*	*t*	*p*-value	Lower Bound	Upper Bound
Intercept	0.16	0.50	0.33	.745	-0.83	1.15
Anger	0.29	0.29	1.00	.319	-0.29	0.87
Sadness	-0.02	0.28	-0.07	.943	-0.57	0.53
Disgust	-0.03	0.29	-0.12	.916	-0.60	0.54
Fear	-0.81	0.28	-2.91	.004	-1.36	-0.26
Joy	0					
Control Variables						
Trial	0.02	0.03	0.64	.522	-0.04	0.08
On Task Child Words	0.12	0.01	13.86	< .001	0.11	0.14
Child Gender	0.38	0.25	1.50	.134	-0.12	0.88
Emoter Size	0.001	0.002	0.85	.396	-0.002	0.004

Table F6.

Mixed Model for Mentioning the Referent for 4.5-Year-olds from Chapter 4

					95% Confidence Interval	
Parameter	*b*	*SE*	*t*	*p*-value	Lower Bound	Upper Bound
Intercept	1.99	0.44	4.51	< .001	1.12	2.85
Anger	-0.77	0.23	-3.40	.001	-1.22	-0.33
Sadness	-1.15	0.32	-3.56	< .001	-1.79	-0.51
Disgust	-0.54	0.29	-1.87	.063	-1.11	0.03
Fear	-0.06	0.21	-0.29	.774	-0.48	0.36
Joy	0					
Control Variables						
Trial	-0.04	0.02	-1.84	.067	-0.09	0.003
On Task Child Words	0.06	0.01	9.08	< .001	0.05	0.07
Child Gender	-0.10	0.19	-0.56	.573	-0.47	0.26
Referent Size	-0.003	0.002	-1.47	.143	-0.01	0.001

Appendix G

Table G1.
Means of 3.5-Year-Olds Emotion Labeling

	Labels					
	Anger	Sadness	Disgust	Fear	Joy	Other
Face Images						
Anger	0.57	0.33	0.17	0.00	0.17	0.50
Sadness	1.00	0.85	0.00	0.00	0.00	1.00
Disgust	0.67	0.07	0.19	0.00	0.13	0.20
Fear	0.27	0.36	0.00	0.29	0.27	0.36
Joy	0.67	0.33	0.00	0.00	0.71	0.00
Context Images						
Anger	0.57	0.20	0.00	0.00	0.40	0.40
Sadness	0.50	0.57	0.00	0.50	0.00	0.00
Disgust	0.57	0.29	0.14	0.00	0.00	0.14
Fear	0.00	0.50	0.50	0.24	0.00	0.50
Joy	1.00	0.00	0.00	0.00	0.41	0.00

Table G2.
Means of 4.5-Year-Olds Emotion Labeling

	Labels					
	Anger	Sadness	Disgust	Fear	Joy	Other
Face Images						
Anger	0.96	0.00	0.00	0.00	1.00	0.00
Sadness	0.50	0.88	0.00	0.00	0.50	0.00
Disgust	0.67	0.00	0.23	0.00	0.13	0.27
Fear	0.38	0.13	0.00	0.71	0.00	0.63
Joy	0.00	0.00	0.00	0.00	0.92	0.50
Context Images						
Anger	0.74	0.25	0.00	0.00	0.00	0.25
Sadness	0.00	0.78	0.00	0.00	0.00	0.00
Disgust	0.50	0.17	0.33	0.00	0.00	0.50
Fear	0.17	0.33	0.00	0.40	0.00	0.50
Joy	0.00	0.50	0.00	0.00	0.72	0.50