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Chapter 3

A COGNITIVE-DEVELOPMENTAL APPROACH TO EMOTION PROCESSING IN CHILDREN

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ABSTRACT

Although cognitive development and emotional development are often viewed as separate components in the development of the child, the two are intricately related to each other. The purpose of this chapter is to review and examine how cognitive development is related to emotional development, and how traditional and current theories of cognitive development provide us with a framework for understanding the development of emotion processing in children. Topics explored in this chapter include the role of executive functioning, language development and cognitive concepts of self on the development of emotional competence. Moreover, three theories of cognitive development: Theory of Mind, Weak Central Coherence theory and Systemizing Theory are considered in relation to cognitive and emotional processing in a special population, children with Autism Spectrum Disorders. Finally, this chapter concludes with a discussion of the remaining challenges for theories of cognitive development, especially in terms of exploring the reciprocal relation between cognition and emotion.

Keywords: Cognitive Developmental Theories, Cognition, Emotion Development, Typical Development, Development in Autism Spectrum Disorder

INTRODUCTION

Traditionally, developmental science has separated the processes, stages and challenges in cognitive development from those involved in emotional development. The result has been that those who study cognitive development per se typically do not study emotional

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development and vice versa. Nevertheless, as this chapter illustrates, cognitive and emotional development influence each other in important ways. The purpose of this chapter is to illustrate how theories of cognitive development, both past and present, provide a framework for the study of emotional development.

This chapter begins with a discussion of traditional theories of cognitive development and how each has informed our study of emotional development. Following that discussion, three contemporary viewpoints taken from a cognitive development perspective: executive functioning, language and thought, and social-cognitive understanding of the self, are presented that provide recent integrations of cognitive development theory with current knowledge about emotional development. Finally, we show how cognitive development theory has implications for the study of emotion development in atypical populations, namely, children with Autism Spectrum Disorders.

The notion that cognition and emotion are mutually influential is not new. Early emotion research by William James (1884) as well as Cannon and Bard (Cannon, 1927), sought to integrate the biological, physical and cognitive manifestations of emotion. Even traditional theories on emotion processing, such as Schacter's work on emotion appraisal theory (Schacter & Singer, 1962) and Zajonc's (1980) theory of primacy of affect are concrete examples of approaches that sought to integrate cognitive and emotional processes. More recent theories have also sought to integrate emotion processing with a cognitive perspective, with perhaps the most explicit example being recent reformations of appraisal theory (Scherer, 2001).

Recent findings suggest that our decision to integrate cognitive development theory with current findings on emotional development is a necessary one. Perhaps most significantly is the reciprocal relation between executive functioning and emotion regulation. Broadly construed, executive functioning involves a number of higher-order cognitive skills that develop during the course of childhood, including but not limited to attention, representational capacity, inhibitory processes, working memory, planning and goal-directed behavior. However, in a reciprocal way, emotions can also affect executive functioning. For example, children with increased sensitivity to aversive stimulation have been shown to exhibit higher concurrent levels of cognitive control and executive attention (e.g., Dennis & Chen, 2007). Moreover, children who are high in inhibitory control are sometimes more prone to overregulation, leading to internalizing types of problems (e.g., Murray & Kochanska, 2002; Zelazo, Qu, & Kesek, 2010).

Moreover, from a neuroscience perspective, a number of recent studies suggest that cognitive and emotional processes are linked in reciprocal ways in the brain. Although beyond the scope of this chapter, neuroscience research has shown a number of important connections between brain activity, top- and bottom-down processing and emotional development in children (e.g., Bell, Greene, & Wolfe, 2010).

Although current applications of cognitive development theory to the study of emotion are most relevant to our integration of cognition and emotion, historical perspectives integrating these processes recap not only important aspects about theories of cognitive development, but also, provide insight into the current shortcomings of modern theoretical work. Thus, in the following section of this chapter, we present classic perspectives on cognitive development, particularly as they apply to emotional development.

TRADITIONAL THEORIES OF COGNITIVE DEVELOPMENT AND APPLICATIONS TO THE STUDY OF EMOTIONAL DEVELOPMENT

I. Neo-Piagetian Perspective on Cognitive and Emotional Development

The beginnings of the neo-Piagetian view can be traced to a number of papers that were published in the seventh and eighth decade of the 20th century (e.g., Case, 1985; Fischer, 1980; Pascual-Leone & Goodman, 1979). Robbie Case, perhaps one of the most influential neo-Piagetians, certainly agreed with many of Piaget's basic tenets (Case, 1985). However, in Case's theory of cognitive development, more attention was given to children's central conceptual structures and how these structures developed. Based on information processing theory, Case (1985) suggested that conceptual structures go through a sequence of stages labeled pre-dimensional, unidimensional, bi-dimensional and integrated bi-dimensional. These stages were thought to correspond to children's thought at roughly 4, 6, 8, and 10+ years of age, respectively. Each of these stages defined how a child was expected to think about and handle information as he or she develops. Case then specified in several domains (e.g., number, space, narrative, emotion) the specific thought structures that developed.

The focus in this chapter will be the relation between neo-Piagetian theory as it applies to the study of emotional development. Even though current cognitive theories of emotional development have shifted away from Piagetian and neo-Piagetian models, their influence on our understanding of emotion is undoubtedly significant. The reader is referred to Case (1985) for a complete discussion of his theory, a brief summary of his main postulates: competencies at birth, structural changes that take place in the months and years after birth, and factors underlying the processes of structural transformations are discussed below. Thereafter, we present Case and his colleagues' neo-Piagetian theory of emotional development (Case, Hayward, Lewis, & Hurst, 1988).

Competencies Present at Birth

Case postulated that infants' earliest cognitive structures are of two general types: those which represent recurrent patterns of stimulation (figurative schemes) and those which represent operations that can be carried out when a particular figurative scheme (or group of schemes) is present. Case (1985) argued that the activation of any scheme by the young infant results in that scheme having an affective character, either positive, negative, or neutral. According to Case (1985), from the age of birth, infants can exercise at least some degree of control over their own cognitive and affective experiences. Relatedly, structures which permit infants to exercise control consist of temporally organized sequences of figurative and operative schemes which may be parsed into schemes representing some particular state in which the child recurrently finds itself, schemes representing some other state which has a higher affective value, and schemes representing the sequence of operations which take the child from one of these states to the other.

Structural Changes That Take Place in the Months and Years After Birth

Case (1985) postulated that four major transformations take place between the ages of birth and 18 years. The subsequent result is that four general stages of cognitive development were identified by Case. Consistent with Piagetian theory, the structures of any one stage

were thought to bear a hierarchical relation to those of the previous stage. Moreover, within each stage, a universal sequence of three substages was identified, namely unification, bifocal, and elaborated coordination.

Beyond these similarities to Piagetian theory, Case and other neo-Piagetians believed that cognitive transformations that took place during these stages depended on a number of elementary information processing skills including those based on schematic search, evaluation, retagging and consolidation (Case et al. 1988). It was believed that these information processes resulted from children's everyday activities, including those independent of others and those that were socially facilitated. Moreover, children's capacity for these information processing skills was believed to be first constrained by the size of short term storage space (STSS) or working memory, and later by cultural and educational factors. Finally, the growth of short-term storage space, or working memory, was thought to play a role in transitioning from one stage of cognitive development to another.

An Application of Neo-Piagetian Theory to Emotional Development

Based on these neo-Piagetian postulates, a number of assumptions about children's emotional development were made (Case et al., 1988). First, Case et al. argued that the emotional system was linked in a reciprocal manner to all other systems, including the perceptual, motor and cognitive systems. For example, once an emotion was elicited, it was assumed that there was an immediate priming of the motor system so that one could signal to others that the emotion was being experienced (e.g., a child frowning). At the same time, there was reciprocal feedback so that further experiencing of that emotion was modulated by ongoing activity and experience (e.g., a parent providing comfort).

Second, during the course of development, Case et al. argued that children encounter certain general classes of emotion-provoking situations with considerable regularity. Accordingly, children develop schemes about those experiences that then influence the characteristic ways they express those emotions, think about those emotions and control (or not control) those emotions. Such schematic structures of emotion increased in complexity according to (1) the same epigenetic schedule (e.g., cognitive stages) that applied to all other developing cognitive structures and (2) increases in short term storage space (i.e., working memory). However, with age, it was believed that emotion structures were less influenced by increases in working memory and more so by cultural and educational experiences.

Although most developmental psychologists have moved away from stage-like representations of cognitive and emotional systems, it is clear that neo-Piagetian theory has been highly influential in current cognitive developmental interpretations of emotion. Perhaps the most easily seen influence of neo-Piagetian theory is the elaboration of "short term storage space" into current beliefs about the influence of components of executive functioning on emotion. Perhaps less obvious is the impact of neo-Piagetian theory on the acceptance of the reciprocal relationship between cognition and emotion. Because neo-Piagetians took the time to specify the relation between cognitive development theory and emotional development, it legitimized our current beliefs about the value in doing so today. Lastly, through a consideration of neo-Piagetian theory, it is possible to see that we still do not have answers to a number of major issues, both within the domains of cognitive development or emotional development. In particular, it remains to be specified the exact changes in cognition that lead to more mature understanding of emotion.

II. Vygotsky, Sociocultural Influences on Cognitive Development and Emotion

Social interactions are an important part of the development of many cognitive processes. Most traditional theories of cognitive development, while acknowledging the role of social interaction, often did not closely examine the reciprocal role of social interactions and cognitive development. The translations of Lev Semenovich Vygotsky's (1896-1934) writings from his native Russian to English in the latter part of the 19th century, however, changed all of this, particularly for developmental psychologists in the United States. According to Vygotsky (1987), social interaction plays a fundamental role in the development of cognition. He believed that mental functioning in the individual can only be understood when social and cultural processes are considered. In fact, one of the main appeals of Vygotskian theory is his analysis of the social origins of mental processes. Vygotsky and his followers (Wertsch, 1991) regarded mental functions as events that can be carried out not only within individuals, but also between individuals in dyads and large groups. In particular, cognition should be understood as a function that can be carried out intermentally (i.e., mental functioning between individuals) or intramentally (i.e., mental functioning within the individual), with intramental functioning developing through mastery and internalization of social processes.

Zone of Proximal Development and Scaffolding

Perhaps one of Vygotsky's most well-known ideas centers on the process or phenomenon known as the "zone of proximal development" (Vygotsky, 1978, 1934/1987). The zone of proximal development can be understood as the distance between a child's "actual development level as determined by independent problem solving" and the higher level of "potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). In other words, it explains the difference between what a child can achieve independently and what a child can achieve with guidance or encouragement from a more knowledgeable partner, such as a parent or teacher. The zone of proximal development refers to functions that have not yet matured, but are in the process of maturing.

Unlike Piagetian theory (1952) that states children's development has to precede their learning, Vygotsky argued that developmental processes can trail behind learning processes. Well-organized learning leads to mental development, which then sets in motion a variety of developmental processes. Learning, or instructive collaboration, can be tied more closely with the level of potential development than actual development (Wertsch & Tulviste, 1992). Because "a child's actual level of development defines functions that have already matured" (Vygotsky, 1978, p. 86), instruction should focus on maturing psychological functions that are needed for the transition to the next age period. Nevertheless, it is important to keep in mind that not all children will have the same size zone of proximal development. Even though they may have the same mental age, some children have already mastered certain psychological tools that make development of that particular skill or concept easier to obtain, with assistance.

In developmental literature, terms such as scaffolding, assisted instruction, or guided learning are used interchangeably with zone of proximal development. Chaiklin (2003)

suggests that the concept "zone of proximal development" should be used to refer to a theoretical phenomenon, whereas scaffolding should be used to refer to teaching a concept or skill. Because Vygotsky does not give a procedure to directly assess the zone of proximal development, scaffolding can be thought of as complementary concept to his theory.

According to Chaiklin (2003), scaffolding can be thought of as a process that allows a child to complete tasks, including cognitive or mental tasks, that are beyond a child's independent efforts. Essentially the more knowledgeable person controls elements of the task that are initially beyond the learner's capacity, thus permitting him or her to concentrate on those elements that are within his range of competence until more mastery is established (Wood, Bruner, & Ross, 1976). Scaffolding is often seen as a type of teacher-child discourse, where the adult questions, summarizes, explains, and predicts in order to nurture the child's explorations, representations, & thinking (Berk & Winsler, 1995). In essence, adults provoke learning, and ultimately development, by scaffolding children's thoughts and feelings through support that is sensitively attuned to the child's current level of competencies (Chaiklin, 2003; Wood et al., 1976).

Application of Vygotskian Theory to Emotional Development

Similar to cognition, research demonstrates that emotional expressions and evaluation of emotions are socially and culturally mediated (Lewis, 1992). Although scaffolding is usually discussed in terms of educational applications, parents can also play the role of teacher, both explicitly and implicitly in helping a child gain emotional competence. Most developmental psychologists would agree that parenting is linked to children's emotional development. In fact, it is possible that the family is the primary environment in which children learn how emotions are expressed, conveyed, and managed (Denham, 1998; Eisenberg, Cumberland, & Spinard, 1998). Subsequently, it stands to reason that parent's scaffolding strategies play a significant role in the development of emotion.

Parental expression of emotion, parent-child discourse about emotion, and parental reaction to a child's emotion all play a part in the processes associated with emotional development (Eisenberg et al., 1998). Parent-child conversations, in particular, are closely tied to Vygotskian theory, whether the conversation is discussing ongoing or current emotions, or reminiscing about past emotions (Fivush & Vasudeva, 2002).

Emotion-related conversations not only communicate support, but enhance a child's awareness of emotional states and promote development of an emotion-related conceptual system (Malatesta & Haviland, 1985). As part of everyday conversations, parents emphasize certain emotions over others, explain causes and consequences of emotions, and help children understand the experience and regulation of emotion. By encouraging conversation about emotional experiences, children are better able to process and express their own emotion as well as others.

Several studies have shown that the amount mothers discuss feelings is significantly related to young children's own speech about emotions, to the extent that mothers who talk more about emotions have children who talk more about their emotional experiences compared to mothers who do not emphasize emotion talk (Denham & Auerbach, 1995; Fivush & Vasudeva, 2002; Kuebli, Butler, & Fivush, 1995). Although the tendency to discuss emotion is influential in scaffolding a child's use of emotion words, the most influential factors may be the content and style of communication. Discourse about ongoing emotions can be very arousing for the parent and the child, where much of the conversation is devoted

to emotion management or emotion control. Still, reminiscing about past events allows the dyad to reflect and interpret the emotional experience, where specific emotions can be examined.

Discussions about past emotions also give the child the ability to become more cognitively aware of the consequences of emotional experience. For example, one day at a grocery store, a young child becomes angry and has a tantrum because her mother does not allow her to eat a box of cookies she has taken from a shelf in the store. After the mother tells her “no”, the child then throws the box of cookies, hitting another person in the aisle. When the mother and child get home and the child’s mood has regulated, the mother may ask the child why she became so angry. The mother may also explain to the child about the appropriateness of throwing a tantrum and the consequences her anger had on others around her.

By emphasizing the relevance of particular events, the mother is then able to promote cognitive understanding of the past and provide an evaluative framework for the child to reflect and understand daily emotional experiences that would not be otherwise obvious to the child (Laible, 2004a; Thompson, Laible, & Onati, 2003). This scenario illustrates how a parent may effectively scaffold emotional development by reminiscing about the emotional experience. Waiting until the emotional event has ceased, the child is more receptive and capable of evaluating and interpreting her emotional experience (Laible, 2004b).

Finally, the effectiveness of parental scaffolding strategies can be influenced, not only by the content, but the style of discourse. Researchers have found that mothers differ in the amount of details and the intensity of discussion they provide when conversing about the past with their children (Reese & Fivush, 1993). Parents with a repetitive style do not provide much background detail to the discussion of the past event, and generally ask only repetitive yes/no questions. In contrast, parents who use elaborative speech often provide a broader explanatory framework by presenting questions about the causes and outcomes of emotional experiences, explaining emotion words, and requesting information from the child about their ideas on emotion. Parents who elaborate about past experiences with their children are therefore more likely to have children who have better memory of these experiences, better socio-emotional understanding about these experiences, and better cognitive understanding of these experiences (Reese & Fivush, 1993).

In essence, parents can scaffold emotional knowledge to their children in a manner that is analogous to the scaffolding that may occur in other domains. In this way, emotional competence is a cognitive process highly dependent upon the social interaction that takes place between a child and others.

III. Information Processing Theory, Cognitive Development and Emotional Development

Information processing theories of cognitive development have attempted to account for cognition and cognitive development by conceptualizing the fluid nature of inputs and outputs. Several reviews have determined that information processing involves two major components: speed of processing and working memory (e.g., Bjorklund, 2012). The information processing approach sets out a specific conceptualization of working memory that includes the visuospacial sketchpad (processes and stores visuospatial information), the

phonological loop (processes and stores audio/verbal information), and the central executive (coordinates the information and functions of the visuospatial sketchpad and phonological loop). It is through these linked stores of information that the individual can process incoming stimuli in an effective manner. These elements contribute to the efficient processing of information and may account for individual differences observed in intelligence (e.g., Fry & Hale, 2000; Jensen, 1998), and between typical and atypical development (e.g., Henry & MacLean, 2003). In fact, studies have suggested that after IQ, working memory is the single best predictor of academic and social outcomes (e.g., Alloway & Alloway, 2010). Given the importance of speed of processing and working memory on cognition and long-term outcomes, it is critical to evaluate how these functions as a cognitive developmental theory account for emotion processing in children.

Working Memory and Emotion Processing

Connections between working memory and emotion processing are supported by the procedures involved with understanding emotion. The child must encode and continuously update relevant information regarding the present situation to evaluate the appropriate affective response. This is particularly relevant to more complex situations that tap into multiple emotions, various situational cues, and competing contextual information. These circumstances will place a greater cognitive demand on children's working memory, such that, children who have more efficient working memory will not only be able to accurately assess the emotional component to a given situation but will also effectively manage conflicting information in favor of more relevant cues. Further supporting this view is past evidence suggesting that working memory is integrally related to mental state understanding (e.g., Carlson, Moses, & Breton, 2002; Mutter, Alcorn & Welsh, 2006), a closely related cognitive-emotive concept.

Evidence for the specific contributions of working memory and emotion processing are rather limited. Preliminary data find that children's working memory, measured by the backward digit span, was related to their application of accurate emotion labels (Pons, de Rosnay, & Philipona Mino, 2005). In a more recent study, Morra, Parrella, and Camba (2011) assessed 5- to 11-year-old children's working memory capacity and emotion comprehension. Their results found that working memory capacity was a significant contributor to children's emotion comprehension, even after accounting for age, gender, and grammar comprehension.

Extensions of Information Processing Theory and Emotion Processing

The information processing theory posits a step-by-step approach in resolving cognitive demands and this framework has been adapted in the development of social information processing theories in encoding, interpreting and acting on social information (e.g., Dodge & Crick, 1990). Studies using this approach have found that accurate encoding, interpretation and adaptive responding to social cues was a positive predictor of preschool children's social competence and school adjustment (e.g., Denham et al., 2013; Ogelman & Seven, 2012). Updates to the social information processing theory have integrated more explicit emotional components to the evaluation of social situations. Studies using this updated theoretical model have found that social information processing and emotion regulation accounted for higher levels of aggression in 7- to 13-year old boys, although much variance in aggression remains unaccounted by these factors (de Castro, Merk, Kooops, Veerman, & Bosch, 2005). Additional

studies will be needed to determine the cognitive-developmental contributions to processing emotional information as it relates to social situations and behavioral outcomes.

CURRENT PERSPECTIVES FROM COGNITIVE DEVELOPMENT ON THE STUDY OF EMOTIONAL DEVELOPMENT

IV. Executive Functioning Theory and Emotional Development

Executive function (EF) is considered a composite of many processes necessary for the regulation of cognition and behavior. The fact is EF encompasses many constructs, operations and functions that guide and link thoughts and behavior (Burgess et al., 2006). Comprehensive analyses have found that in contrast to early views of a unitary EF construct, three main functions emerge as dominant: shifting, inhibition, and updating (Miyake et al., 2000). Emotion regulation (ER) has been defined as the monitoring of internal and external representations of emotion (Gross, 2010) and has often been considered an important developmental hallmark of the early childhood years (Bronson, 2000). The capacity to regulate the internal processing and external portrayal of emotional states is important for young children as it facilitates social interactions with peers and can set the stage for (mal)adaptive behaviors in later development (Cole, Michel, & Teti, 1994).

Due to the similar processes involved in EF and ER, it is important to disentangle how these concepts can influence one another throughout development. As outlined by Carlson and Wang (2007), three distinct models can be derived from the relationship between EF and ER. First, EF may underlie ER development by providing a platform for ER to emerge. With specific EF abilities enabled (e.g., inhibition, shifting), the child is able to suppress negative emotions and/or behaviors if inappropriate and activate positive thoughts and actions. Second, ER may contribute to EF by releasing cognitive resources through effective moderation of emotional influences. When a child is able to manage their internal thoughts and external actions successfully, they allow for EF abilities to emerge without competition for the limited cognitive resources. Third, it may be that EF and ER are intertwined in the process and only differ based on the current demands and goals. For example, if a child receives a disappointing gift, the demands and goals for EF and ER are the same—inhibit a negative emotional response to avoid displeasing the gift giver.

Recent work has posited that the relationship between EF and ER may be based on multiple shared properties (Calkins & Marcovitch, 2010). Biologically, the anterior cingulate cortex mediates the attentional demands in regulating thought and behavior with neural links to the prefrontal cortex—regulating cognition and behavior—and to the limbic system—regulating emotion (e.g., Lane & McRae, 2004; Luu & Tucker, 2004). Psychologically, EF and ER both depend on attentional mechanisms in orienting, sustaining and shifting to relevant stimuli and these mechanisms can be traced to early manifestations of EF and ER in infancy (e.g., Posner & Rothbart, 2007).

The results of studies on EF and ER have been mixed particularly in terms of the specific aspects of EF that are related to ER. Some studies report positive relations between executive attention and ER in 7- to 10-year old children (e.g., Simonds, Kieras, Rueda, Rothbart, 2007), while others find inhibition to be related to ER in preschool children (Carlson & Wang, 2007)

and 10- to 13-year old children (e.g., Hoeksma, Oosterlaan, & Schipper, 2004). Other studies have also found that general EF to be related to ER among preschool children (e.g., Leerkes, Paradise, O'Brien, Calkins & Lange, 2008). Although informative, these studies only provide information about the static relationship between EF and ER and therefore do not lend critical information about the developmental progression in the links between EF and ER.

To date, only one study has attempted to evaluate the role of ER on EF in children (8-, 10-, and 12-year olds). Across a series of experiments, Pnevmatikos and Trikkalotis (2013) demonstrated that inducing an emotionally arousing event, thus taxing children's ER, negatively affected children's performance on an inhibition task. The negative effects of the frustrating event persisted past 10 minutes of the event, thus indicating that ER abilities can consume cognitive resources well beyond the additional exposure of positive events.

Future studies are needed to determine the developmental nature of the relationship between EF and ER. Given the multifaceted construct of EF, it is important for these studies to independently measure specific EF abilities (e.g., inhibition, shifting, etc.) to determine which profile is more directly related to ER. In addition, due to the continued development of EF from early childhood through adolescence (e.g., Luna, Garver, Ruban, Lazar, & Sweeney, 2004; Pureza, Gonçalves, Branco, Grassi-Oliveira, & Fonseca, 2013), it is imperative to evaluate the simultaneous evolution of ER throughout this developmental period.

V. Language Development, Cognitive Development and the Development of Emotional Competence

During toddlerhood and early childhood, young children make enormous gains in language development: they utter their first words, they combine words in meaningful ways, they build both expressive and receptive vocabularies, and they acquire grammatical rules governing the use of their language(s). At the same time, young children express emotions, learn emotion labels, and self-regulate—albeit to varying degrees of success—emotion. Although most theories of cognitive development do not specify the manner in which language develops, clearly the two are intrinsically involved, with delays in cognitive development often resulting in delays in language development (e.g., Hagbergs, Miniscalco, & Gillberg, 2010). In a similar way, language and emotion are linked. According to Cole, Armstrong, and Pemberton (2010), four distinct lines of developmental research suggest that language and emotion are linked.

First, research finds externalizing behavior problems are often accompanied with poor language skills (e.g., Kaiser, Cai, & Hancock, 2002). Emotion regulation difficulties often accompany externalizing behaviors, and subsequently it is thought that emotion regulation is linked in some way with language development. In fact, language delays and emotion dysregulation could be the result of the same underlying mechanism or mechanisms, because both of these deficits can involve executive processes. Conversely, it is also possible that understanding and producing language may uniquely contribute to self-regulatory abilities in childhood (Cole et al., 2010).

Second, the relation between language development and emotional development is believed to mature over a period of time, although not always in tandem with each other. When children first begin speaking, their vocabulary increases rapidly, yet the use of emotional expressions does not appear to develop simultaneously with word production

(Bloom & Capatides, 1987). Bloom (1993) proposes that language learning and emotional development both recruit cognitive resources. When children are highly emotional, word production may therefore be disadvantaged, because they are using cognitive resources to regulate their emotions. Thus, the ability to use emotional expressions in discourse only appears to occur once a child has developed a basic level of verbal ability. After which, children begin to use emotional expressions in their verbal exchanges (Garner & Lemersie, 2007), as well as exhibit some control over these verbal expressions (Garner & Power, 1996).

Third, research has explored the relation between emotion language, sometimes referred to as “internal state language”, and emotional development (Cole et al., 2010; Eisenberg et al., 2001). Internal state language refers to words or phrases that represent mental states and perceptual experiences. From an early age, these types of emotional expressions have been linked to socioemotional competence (Denham et al., 2003). As seen in our earlier discussion on scaffolding, parent’s use of emotion words is associated with children’s socio-emotional understanding. Through discourse about emotions, parents can scaffold their children’s ability to evaluate on their own as well as other’s emotional experiences. Parental scaffolding may also promote a child’s ability to inhibit affect, self-soothe, focus their attention, and regulate their emotions (Gottman, Katz, & Hooven, 1997). In turn, increased emotional awareness may foster the child’s emotional regulation (Roben, Cole, & Armstrong, 2013).

Finally, and in a related manner, research has shown that children’s self-verbalizations are connected to their self-regulation abilities. Vygotsky (1962) theorized that humans use inner speech as a way to regulate their action. Children begin by using egocentric speech, or self-verbalization, while they are transitioning from external to inner speech (Vygotsky, 1934/1987). Vygotsky suggests that a child’s egocentric speech reflects the emergence of new self-regulation function similar to the use of inner speech by adults. Luria (1961) also saw children’s self-verbalizations as regulatory efforts. Self-verbalization provides children with the means to reflect upon and guide behaviors (Metcalf & Mishel, 1999), as well as distract themselves during emotional experiences they cannot control (Fox, 1989).

Language and Emotion Perception As is evident at this point, cognition and emotion are intimately intertwined. A related connection between language and emotion is the influence of language on individuals’ perception of emotion.

In everyday life, unlike the stereotyped configurations of facial expressions used in a significant number of studies, the structural information a face provides is much more variable and ambiguous. A recent line of research has hypothesized that language serves as a context in which this ambiguity can be reduced (Barrett, Lindquist, & Gendron, 2007). Moreover, research has shown that emotion labels or emotion words can facilitate the recognition of emotion. Conversely, when individuals are asked to free label emotions on others, their recognition accuracy is often significantly reduced (Russell, 1992). Emotional language may also cause a perceptual shift in the categorization of faces. Halberstadt and Niedenthal (2001) found that when they morphed faces equally expressing a combination of angry and happiness, faces that were labeled *angry* were perceived to be angrier.

The connection between language and emotion perception is even more evident when perception is examined after language has been manipulated. Verbalization has been found to disrupt the perception of facial expressions, presumably because it interfered with the ability to make judgments about category membership (Roberson & Davidoff, 2000). Language can also be manipulated using a technique called semantic satiation. By repeating a word over and over again, it has been shown that this repetition causes a temporary decrease in the

accessibility of the word's meaning. Using this technique, Lindquist, Feldman-Barrett, Bliss-Moreau, and Russell (2006) found that by temporarily reducing the accessibility of a particular emotion word, people were much slower and less accurate at perceiving emotion. This same finding also held up when the participants were not required to verbally label the facial expression.

Therefore, it is evident that language, and the cognitive processes underlying language (e.g., the categorization of words), have the ability to shape our understanding of emotion. By creating emotion categories, similar to other cognitive categories, the uncertainty that is present in natural facial expressions is reduced. These cognitive categories constrain the meaning of the emotion word, allowing for rapid and implicit perception of emotion. Although there has yet to be any studies that directly explore how children's acquisition of specific emotion words effect the perception of these categories, there has been some evidence that this process is already in place in childhood (de Rosnay, Pons, Harris, & Morrell, 2004; Russell & Widen, 2002). In light of these findings, it is clear that future research should consider the interplay between cognitive development, language development and the development of emotional competence.

VI. Cognitive Development of the Self Concept and Emotional Development

The ability to conceptualize, reflect upon and understand one's own emotions and the emotions of others is central to emotional competence. In particular, a cognitive awareness of one self that is distinct from others is paramount in socio-emotional competence. This process begins with the ability to recognize others' preferences in infancy (e.g., Repacholi & Gopnik, 1997). A few years later, children learn to make inferences about others' internal states, as well as their own, realizing that internal states differ across individuals (e.g., Lagattuta, 2005; Rieffe, Terwogt, & Cowan, 2005). At the same time, children learn to label their emotions and the emotions of others (e.g., Garner & Lemerise, 2007), and they learn to provide narratives about their emotional experiences (Nelson & Fivush, 2004). Later, the ability to self-regulate emotions develops (e.g., Eisenberg & Spinrad, 2004).

Some emotions, however, may require more cognitive self-reflection than others. Basic emotions (anger, disgust, fear, happy, sad, surprise), for example, may often be elicited without a great deal of self-reflection. Take a fearful situation: during a walk in the woods, one stumbles upon a large, menacing bear. Here, it is expected that one's emotional response would primarily be a visceral, hardwired response to a threatening situation. Likewise, walking in on a surprise party thrown in one's honor—and subsequently feeling surprised—requires little self-reflection. Other emotions, however, do require self-reflection. These include self-conscious emotions such as embarrassment, pride, guilt and shame.

Although cognitive developmental theories have rarely, if ever, been directly applied to the study of self-conscious emotions, everything we know about self-conscious emotions suggests cognitive developmental processes underlying their acquisition. Thus, cognitive developmental theory should be applicable to studying how self-conscious emotions develop. In particular, five major features distinguish self-conscious emotions from other emotions (Tracy & Robins, 2004a). First, self-conscious emotions require self-awareness and self-representations. Although there are times when basic emotions (e.g., sadness) can and often do involve self-evaluative processes, only self-conscious emotions *must* involve these

processes (Tracy & Robins, 2007). Moreover, these self-representations must include relational, social and collective information; that is, how we see ourselves vis-à-vis close relationships with others, as a member of social groups, and as a member in a broader cultural collective.

Second, self-conscious emotions differ from basic emotions in their lack of discrete, universally recognized facial expressions (although see, e.g., Tracy & Robins, 2004b). A third distinctive feature about self-conscious emotions is that they emerge later in childhood than basic emotions. Though it is believed that most basic emotions emerge within the first 9 months of life (e.g., Campos, Barrett, Lamb, Goldsmith, & Stenber, 1983), generalized feelings of self-conscious emotions (e.g., early feelings of embarrassment) do not develop until 18-24 months (Lewis, 2008), with the rudiments of more complex self-conscious emotions such as shame, guilt and pride, developing sometime after the child's second or third year.

Lewis (2008), in his studies of the origins of the self-conscious emotions, argues that to understand the ontogenesis of these emotions in children, it is necessary to consider the cognitive developmental processes that likely give rise to them. Lewis suggests that the emergence, both phylogenetically and ontogenically, of the mental representation of "me" or self-reflected awareness, provides the capacities most necessary for the emergence of these self-conscious emotions. According to Lewis, it is the capacity to think about the self (e.g., self-reflection or self-awareness) along with other emerging cognitive capacities that provides the basis for these emotions, starting at the end of the second year of life.

A fourth feature is that self-conscious emotions facilitate the attainment of social goals, such as the maintenance or enhancement of social status or the prevention of group rejection (Keltner & Buswell, 1997; Tracy & Robins, 2007). Self-conscious emotions also serve the maintenance of personal goals, such as feeling good about oneself (i.e., pride) or avoiding situations that make one feel bad (i.e., that may evoke guilt). Perhaps in this respect, the Vygotskian view of cognitive development is most relevant, to the extent that cognitive development is considered within the context of the child's social world. However, research, particularly cross-cultural research, is still needed to explore how parents might teach their children about self-conscious emotions.

The final feature of self-conscious emotions makes them most relevant to theories of cognitive development. In particular, self-conscious emotions are more cognitively complex than other emotions. To return to our example of fear, in order to experience fear, individuals need very few cognitive capacities. In contrast, to experience self-conscious emotions such as shame, an individual must not only be able to have self-representations, that individual must also be able to reflect on those self-representations particularly in relation to others.

Cognitive-Attribution Model of Self-conscious Emotion Development

In order to define the cognitive processes underlying self-conscious emotions, Lewis (2008) developed a cognitive-attributional model of self-conscious emotions. The first feature of this model takes into account the standards, rules and goals (SRGs) that govern our behavior. According to Lewis, all of us hold beliefs about what is acceptable for ourselves and for others with regard to the standards, rules and goals of our respective social and cultural groups. Thus, evaluation of one's own actions in relationship to SRG's is a major cognitive-evaluative process that serves as the stimulus for self-conscious emotion development. Specifically, this self-evaluation process has to do with learning what

constitutes success or failure, both in terms of one's internal SRGs as well as the SRGs of the society in which the individual lives. Relatedly, is the role of responsibility. Take for instance a person who violate SRGs, but does not take responsibility. That is, a person may explain his or her failure in terms of chance or in terms of the actions of others. Conversely, there are others who blame themselves no matter what happens (Lewis, 2008). In either case, however, responsibility for actions can result in the development of self-conscious emotions, or when responsibility is absent, can result in the lack of self-conscious emotions.

Although cognitive processes are clearly related to self-conscious emotions, it remains to be determined how general theories of cognitive development, as well as specific assumptions about cognitive development, relate directly to the development of self-conscious emotions. Promising future research, however, might include applications of executive functioning to the development of self-conscious emotions. Moreover, this process may be reciprocal. For example, self-conscious emotions are now theorized to be fundamentally involved in the regulation of social behavior. In fact, at least one study has shown that deficits in behavioral regulation are associated with impairments in interpreting the self-conscious emotions of others and that the opposite may be true as well (Beer, Heery, Keltner, Scabini, & Knight, 2003).

CHALLENGES AND LESSONS FROM ATYPICAL DEVELOPMENT: COGNITIVE DEVELOPMENTAL THEORIES AND LINKS TO EMOTIONAL COMPETENCE IN AUTISM SPECTRUM DISORDER

In this section we turn our attention to three current theories of cognitive development: Theory of Mind, Weak Central Coherence Theory, and Systemizing Theory, in a special population: children with Autism Spectrum Disorder (ASD). Each of these theories specify the unique manner that children with ASD processes information. Applications of each of these theories to the study of emotional development in children with ASD are then provided.

VII. Theory of Mind, Cognitive Development and Emotion Processing

According to Nader-Grosbois and Day (2011), Theory of Mind (ToM) refers to one's ability to understand the mental states of others including perceptive states (perception and attention), motivational states (desire and intention), epistemic states (beliefs and false beliefs), pretence, thinking and emotions. Put more simply, ToM is thought to correspond to an individual's ability to infer or attribute mental states in others. Detecting mental states in others allows one to understand the causes and consequences of emotion, and also allows one to develop empathy toward others. In short, ToM facilitates social interactions between oneself and others.

More precisely, researchers have suggested that two orders of ToM exist (Baron-Cohen, 1995). First-order ToM refers to inferring the thoughts of another person, whereas second-order ToM refers to reasoning about what another person besides oneself thinks about another. For the latter, this might include a child watching two other children and then reasoning about what the second child is thinking about the third. In this sense, it is believed

that ToM is specifically linked to self-conscious emotions, given that knowledge of oneself in relationship to others is essential for the expression and understanding of self-conscious emotions.

Indeed, past research has shown that delays in ToM may be related to difficulties in processing emotions. In an early study, Capps, Yirmiya, and Sigman (1992) asked children with Autism Spectrum Disorders (ASD), typically developing (TD) children and developmentally delayed children to report personal experiences for two self-conscious emotions: embarrassment and pride. They found that children with ASD had problems recounting experiences of self-conscious emotions, conveying factual rather than personal information. These same children, however, were able to recount personal experiences for basic emotions. More recent studies have shown that children with ASD (Rieffe, Meerum Terwogt, & Kotronopoulou, 2007) and adults with ASD (Hill, Berthoz, & Frith, 2004) find it more difficult than TD individuals to describe their own emotional experiences. It is not clear, however, if this alexithymia is more common with self-conscious than basic emotions. Furthermore, when presented with hypothetical situations and asked whether or not a protagonist should be embarrassed, children with ASD and TD children were equally capable of recognizing the significance of an audience in causing embarrassment (Hillier & Allinson, 2002). Some have suggested that differences in applying these emotions to themselves or to others may be due to underlying ToM abilities (Heerey et al., 2003; Nader-Grosbois & Day, 2011). For example, Heerey et al. found in children with ASD their perception of shame and embarrassment was positively associated with two aspects of ToM: their ability to understand that behavior has social consequences in the eyes of others and their understanding of social norm violations.

Interestingly, ToM theory has shown a great deal of promise connecting cognitive processes in children with ASD with the development of emotional competence. Cognitive abilities, and cognitive development in children with ASD, also appear to be governed by principles of Weak Central Coherence and principles of Systemizing Theory. That is, there are a number of ways that the cognitive processes of the child with ASD may differ from the cognitive processes of a TD child. In turn, these differences in cognition, along with differences in the development of cognition, may result in a developmental trajectory of emotional competence that differs significantly from that seen in TD children.

VIII. Weak Central Coherence Theory, Cognitive Development and Emotion Processing

Conceptualizing the cognitive and behavioral profiles of Autism Spectrum Disorders (ASD) has been a challenging task given heterogeneity in individuals. Much has been learned in the past six decades regarding the theoretical underpinnings of how individuals, particularly children, with ASD manifest their individual profiles of social communication difficulties and restricted and repetitive behaviors and/or interests. One theoretical model proposed in the late 1980's approached ASD symptoms, not as deficits per se, but rather as a different method of processing information—the Weak Central Coherence theory (Frith, 1989). This theory suggests that individuals with ASD can process information, but approach information by focusing on the local processing of details, in contrast to the global processing of information often seen in typical development.

Early formulations of the Weak Central Coherence theory suggested that this preference for local information results in a cost to global processing (Frith, 1989; Happé & Frith, 2006). Early evidence supported this interpretation of cognitive processing in ASD (e.g., Frith & Snowling, 1983; Happé, 1997; Jolliffe & Baron-Cohen, 1999). However, more recent evidence suggests that although local processing may be a predominant approach in individuals with ASD, this is not always coupled with a disadvantage or deficit in processing global information (e.g., Caron, Mottron, Berhiaume, & Dawson, 2006; López & Leekam, 2003). These findings are further complicated by studies that indicate that weak central coherence may not be universal or even a unitary construct within individuals with ASD. Several studies have demonstrated that children with ASD displayed varied profiles of local and global processing across visuospatial and linguistic tasks (e.g., Loth, Gómez & Happé, 2008).

Although the literature on Weak Central Coherence theory in ASD is conflicted with the heterogeneity of cognition, Weak Central Coherence theory can still provide a viable approach to understanding the development and mastery of emotion processing in children with ASD. Studies on face and emotion processing have capitalized on the position of Weak Central Coherence theory to investigate if the local processing biases are in some way related to the well-established difficulties seen in processing emotion in individuals with ASD. Several studies have found that individuals with ASD focus on local features of the face when processing emotions, primarily the mouth, rather than the global configuration (e.g., Gross, 2005; Joseph & Tanaka, 2003; Klin, Jones, Schultz, Volkmar, & Cohen, 2002). Moreover, a greater attention to local information may result in a hyperfocusing, neglecting the integration of important cues, such as emotional expression and/or emotional cues (e.g., Aljuneid & Frederickson, 2011; Ploog, 2010). These results provide an adequate base to develop interventions and instructional materials that will enhance emotion processing in children with ASD.

Recent evaluations have been conducted to determine the efficacy of implementing Weak Central Coherence principles in emotion/social training paradigms. For example, the *Let's Face It!* computerized program aims to improve the integration of facial features, namely the mouth and eyes, in children and adolescents with ASD (Tanaka et al., 2010). Early results showed that after 20 hours of intervention, significant improvements in the recognition of facial identity and facial feature integration were evident in children and adolescents enrolled in the intervention in comparison to children and adolescents on a waitlist (Tanaka et al., 2010). Other similar computerized intervention programs have demonstrated some generalization of emotion understanding from photographs used in the intervention (e.g., *FaceSay*) to schematics used in follow-up assessments (Hopkins et al., 2011). Follow-up studies will need to be conducted to determine the long-term effects of emotion processing interventions based on Weak Central Coherence principles. Of concern as well is how the skills learned through computerized formats will translate into real-world interactions and how the learning of emotional information will be maintained throughout the changing social demands of childhood into adulthood.

IX. SYSTEMIZING THEORY, COGNITIVE DEVELOPMENT AND EMOTION PROCESSING

Systemizing Theory is a cognitive developmental theory based on atypical cognition-emotion profiles (Baron-Cohen, 2002, 2008). Systemizing Theory is primarily linked with Autism Spectrum Disorders (ASD) and proposes that individuals with ASD are guided by systematic relationships in processing information, suggesting that consistency in rules and patterns are crucial for learning (Baron-Cohen, 2008). According to Systemizing Theory, individuals with ASD determine causal links between input (i.e., incoming stimuli) and output (i.e., resulting effect of stimuli), placing greater focus on the correlated functions between the input and output (Baron-Cohen, 2002). Once this process is complete, a rule is created and utilized, however, when exceptions occur, the rule is revised with new information. This pattern of processing information can be useful as it allows the individual to anticipate outcomes. However, an overreliance on detecting these rules can create difficulties in processing information that does not function in a consistent and/or predictable manner.

To date, there is much evidence that indicates that individuals with ASD have a greater drive to systemize than their neurotypical peers (Baron-Cohen, Wheelwright, Spong, Scahill, & Lawson, 2001; Krajmer, Špajdel, Celec, & Ostatníková, 2011; Lawson, Baron-Cohen, & Wheelwright, 2004). However, current research on the role of systemizing in emotion processing is rather limited and in need of comprehensive evaluation. Initial investigations of systemizing skills in children and adolescents with Asperger's Syndrome found a negative relation between performance on an intuitive physics test and a test of emotion recognition (Baron-Cohen, et al., 2001). This finding supports previous findings of difficulties in emotion processing and empathizing in children with ASD (e.g., Auyeung, et al., 2009; Golan, Baron-Cohen, & Golan, 2008).

Although research connecting Systemizing Theory with emotional competence in children with ASD is limited, systemizing principles have been used to develop emotion training tools for children with ASD. Golan et al. (2008) developed *The Transporters*, an animated DVD series that presents human faces on vehicles participating in various social interactions. This presentation was expected to appeal to the systemizing drive in children with ASD as the animated vehicles could only move through predictable motions. After a four-week intervention using *The Transporters* in the home, Golan et al., (2008) found that children with ASD between 4 to 7 years of age showed significant improvements in emotion processing when compared to matched ASD and typically developing control groups. While it is unclear how the gains in emotion understanding in children with ASD will generalize to their daily routines over time, these results provide some promise in utilizing systemizing processes to facilitate emotion understanding in ASD.

Further support in using a systemized approach to improve emotion processing in ASD comes from studies of the *Mind Reading* program in adolescents and adults with ASD (Golan & Baron-Cohen, 2006). This program is comprised of a taxonomic system of emotions and includes dynamic visual, verbal and contextual information for each emotion. There are multiple opportunities to learn about emotions through browsing of the emotion database, and selecting individualized lessons, quizzes, and games. After using the *Mind Reading* program for 10 weeks, adults with ASD showed improved emotion recognition when compared to an ASD control group, however, when compared to an ASD group participating in a social skills

group, the only gains evident were in recognition of voices and recognition of emotion concepts, two aspects of the *Mind Reading* program. Thus, it seems that the generalization of emotion processing in the *Mind Reading* program may be limited, however, further research is needed to determine the effectiveness of this program in children with ASD.

CONCLUSION

Although the study of cognitive development has traditionally been separate from the study of emotional development, as this chapter attests, the intersection of these two major life developments is clear: cognitive development must impact emotional development. Throughout the years, however, the manner in which cognitive development affects emotional development, has been open to debate. Nevertheless, traditional theories of cognitive development (e.g., neo-Piagetian, Vygotskian, information processing) provided the first step toward integrating cognitive and emotional development. We believe that recent theoretical views about cognitive development (e.g., executive functioning) will continue this integration. Moreover, applications of cognitive developmental theories to special populations, particularly children with ASD, are proving useful in understanding the novel relations between cognitive development and emotion processing, as well as the challenges seen in these children, particularly in terms of emotion processing.

Nevertheless, a number of challenges remain for modern theories of cognitive development. These include understanding more clearly how cognitive development affects development in other areas, including emotional development. Still, based on the success of past research, it is expected that future theories of cognitive development will not only move us closer to fully understanding cognitive development but also, move us closer to understanding how cognitive development affects other significant developments, including emotion development, that are tantamount to the development of the child.

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