5-2005

Does Joint Attention Mediate the Relationship between Temperament and Language?

Brenda J. Salley
East Tennessee State University

Does Joint Attention Mediate the Relationship Between Temperament and Language Development?

A thesis

presented to

the faculty of the Department of Psychology

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Master of Arts in Psychology

---

by

Brenda J. Salley

May 2005

Wallace E. Dixon, Jr., Chair

Jon B. Ellis

Andrea D. Clements

Keywords: joint attention, temperament, language, infant, individual differences

ABSTRACT

Does Joint Attention Mediate the Relationship
Between Temperament and Language Development?

by

Brenda J. Salley

Individual differences in child temperament have been associated with individual differences in language development; similarly, relationships have been separately reported among temperament, language, and early nonverbal social communication (joint attention). The present study examined the relationship between temperament and language in the context of joint attention as an underlying developmental variable mediating this association. Temperament, language, and joint attention were assessed in 51 Appalachian 21-month-old toddlers. Results indicate a relationship between aspects of temperamental difficulty, including low executive control and high negative affect, and low language. A relationship was also found between temperament and joint attention, such that aspects of high negative affect were predictive of less frequent joint attention engagement. No association was found between joint attention and language at 21 months. Therefore, in general, the utility for a model of joint attention as a mediating variable in the relationship between temperament and language was not substantiated.

DEDICATION

In Memory of Elsie Tucker Moody

A beautiful example of uncommon determination and strength

ACKNOWLEDGEMENTS

I would like to thank Dr. Wallace Dixon for the guidance, mentorship, and patience to wait until I figured out the questions to ask. You have taught me the importance of being a scientist first. Thank you to Dr. Andrea Clements for your support, encouragement, and gentle reminders to temper my impulses to tackle everything. I thank Dr. John Ellis, who first sparked my interest in this field and inspired me to become a psychologist.

Thanks to all of my fellow students working at the Program for the Study of Infancy and all of the special people in my life that make every day better. Finally, thank you to my wonderfully forbearing family. With you believing in me, I could never really fail.

CONTENTS

Page

LIST OF TABLES

Table Page

CHAPTER 1

INTRODUCTION

Almost from the moment of birth, parents and caregivers notice the unique temperamental characteristics of a newborn infant - individuality that becomes distinctly evident as the infant matures. Many of these individual differences in temperament have been associated with various developmental outcomes. As a result, diverse fields of research have attempted to sort out the ubiquitous influence of temperament. Consequently, much about the evolution of temperament and personality could potentially be clarified with integration of these various research lines. In particular, an interesting family of associations has been separately documented among temperament, social development and language, such that, temperamental factors are implicated in both social development (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Kochanska, 1997; Rubin, Burgess, & Hastings, 2002; Sanson, Hemphill, & Smart, 2004; Sanson, Oberklaid, Pedlow, & Prior, 1991) and language development (Dixon & Shore, 1997; Dixon & Smith, 2000; Karrass, 2002; Kubicek, Emde, & Schmitz, 2001; Morales et al., 2000; Slomkowski, Nelson, Dunn, & Plomin, 1992).

Social developmental outcomes, including externalizing behavior problems (e.g., aggression, oppositionality, anger), internalizing behavior problems (e.g., anxiety, depression) and social competence (including peer relationships, parent-child interactions and school functioning) have been found to encompass many of the processes associated with temperament (for a recent review see Sanson et al., 2004). For example, the temperamental dimension of negative emotional reactivity (high anger and aggression) has been associated with externalizing behavior problems such as conduct disorder (Sanson & Prior, 1999); early temperamental

inhibition has been shown to be predictive of internalizing behavior problems such as anxiety disorders (Biederman et al., 2001; Schwartz, Snidman & Kagan 1999); and both self-regulation and negative emotionality have been related to diminished social skills (Eisenberg et al., 1993). Although these associations along with their clinical implications have been widely examined, the common developmental mechanisms underlying the pathway between temperament and these social developmental outcomes have not been as thoroughly considered.

A growing body of literature has also revealed links between temperament and language development. The theoretical and empirical work of Bloom and colleagues (1993; Bloom & Tinker, 2001) supports the role of temperament in the ability to learn language. Other researchers have linked specific temperamental dimensions to both expressive and receptive vocabulary (Dixon & Smith, 2000; Karrass, 2002; Matheny, 1989; Slomkowski et al., 1992). Moreover, early language has also been found to be predictive of adaptive social development. Notably, the risk for behavior problems has been associated with both poor language skills (Baker & Cantwell, 1987; Carson, Klee, Perry, Muskina, & Donaghy, 1998; Cohen, Barwick, Horodezky, & Isaacson, 1996; Coster, Goorhuis-Brouwer, Nakken, & Spelberg, 1999; McCabe & Meller, 2004; Miller & Scarr, 1989; Thomas, Chess, & Birch, 1968; Vallance, Cummings, & Humphries, 1998) and characteristics of temperamental difficulty, such as negative reactivity, low or high behavioral inhibition and poor attention regulation (Kagan & Snidman, 1999; Rothbart & Bates, 1998; Sanson & Prior, 1999; Sanson, Smart, Prior & Oberklaid, 1993; Schwartz, Snidman, & Kagan, 1996, 1999). However, as with temperament and social development, few studies have examined underlying developmental mechanisms common to temperamental difficulty and language delay. Understanding more about these commonalities may prove useful for understanding exactly how temperamental factors could either mitigate or increase the likelihood

for certain developmental outcomes, such as language delay, behavior problems or developmental delays. Accordingly, one goal of the present study is to consider one possible developmental mechanism through which temperament might affect one aspect of social development, thereby furthering our understanding of temperamental influences on other developmentally interconnected factors, including language and social outcomes.

Joint attention, one component of nonverbal social communication, may be one such key underlying mechanism mediating the link between temperament and language and social developmental outcomes. The social, cognitive, and self-regulatory developmental aspects that collectively form the foundation for joint attention may be influenced by specific temperamental characteristics or styles, and may consequently mediate associations between other factors such as between social skills and either language or the vulnerability for behavior disorders. Unfortunately, though researchers have reported relationships between joint attention and language development (Desrochers, Morissette, & Ricard, 1995; Markus, Mundy, Morales, Delgado, & Yale, 2000; Morales et al., 2000; Mundy & Gomes, 1998; Mundy, Kasari, Sigman, & Ruskin, 1995; Ulvund & Smith, 1996), and though associations have been documented between temperament and joint attention (Vaughan et al., 2003) little consideration has been given to the implications of individual differences in temperament for individual differences in joint attention and consequent language development. Theoretically, temperament may work through social developmental factors like joint attention to influence language and in this way temperament and joint attention may conjointly play a role in typical childhood development and maybe even developmental psychopathology (i.e., behavior problems and disorders). Indeed, recent research has documented that joint attention may predict later behavioral outcomes (Sheinkopf, Mundy, Claussen, & Willoughby, 2004).

The goodness of fit model, described by Thomas and Chess (1977; Chess & Thomas, 1991), underscores the importance of studying the fit, or lack of fit, between the individual and the environment. In other words, taking into consideration the complete relationship between the individual and the environment is central to an accurate understanding of the outcome of the individual. Accordingly, Paterson and Sanson (1999) reported that externalizing behavior problems and social skills were predicted by the "goodness of fit" in the child's home, or in other words, the degree to which the characteristics of the home positively or negatively influence the development and expression of the child's abilities and characteristics. Thus, the consequence of any developmental process is partially the result of the match between the individual characteristics of the infant and the environmental conditions experienced by the infant. In this way, the quality of the fit between child temperament and his or her environment may influence the ability to participate in social exchange and other developmental outcomes. Cicchetti and Cohen (1995) take this a step further to propose a transactional model which highlights the significance of the constant, interactive and changeable relationship existing between the child and the environment, importantly underlining temperament as a potential risk and/or protective factor.

Taking these theoretical models into consideration, the following families of associations have been documented: (1) temperament has been related to language development (Dixon & Shore, 1997; Dixon & Smith, 2000; Karrass, 2002; Kubicek et al., 2001; Morales, et al., 2000; Slomkowski et al., 1992); (2) temperament has been associated with behavioral outcome (Bates, Maslin, & Frankel, 1985; Sanson et al., 1991); (3) deficits in language development have been related to the risk for behavior problems and disorders (Baker & Cantwell, 1987; Beitchman, Hood, & Inglis, 1990); and (4) joint attention has been associated with temperament (Vaughan et

al., 2003), language development (Carpenter, Nagell, & Tomasello, 1998; Morales et al., 2000; Mundy & Gomes, 1998; Sigman & Kasari, 1995; Smith & Ulvund, 2003), and socio-behavioral outcome (Sigman & Ruskin, 1999; Ulvund & Smith, 1996). Therefore, a closer inspection of the underlying threads sustaining these associations may provide useful information in each of these dimensions. The discussion that follows will begin with an overview of temperament following the work of Rothbart and Bates (1998), a brief review of social development and language, respectively, followed by a description of joint attention and finally an integration of these distinct areas of research.

Temperament

Although prominent theorists disagree about the conceptualization of temperament (Buss & Plomin, 1984; Kagan, 1994; Rothbart & Derryberry, 1981; Strelau, 1983), Goldsmith and Rieser-Danner (1986) summarize several areas upon which there is general consensus: 1) temperament creates individual, rather than universal, differences across several areas of behavior, 2) temperament is apparent from early infancy, 3) temperament is relatively stable, 4) biological processes seem to underpin temperament, and 5) environmental experiences may influence the expression of temperament. As such, temperament can be conceptualized as a biologically based, relatively stable pattern of individual behavior, the expression of which is partially determined by environmental circumstances (Rothbart & Bates, 1998).

The underlying biological contributions to temperament have long been a focus for researchers. In the late 1960s, Escalona proposed that the same environmental events will be experienced differentially by children as a result of individual biological differences (Escalona, 1968). Although investigations of the biological basis of temperament have been relatively

common, theoretical contributions have been somewhat limited, and restricted to comparatively broad biobehavioral pathways of influence. Behavioral geneticists have demonstrated the considerable heritability of temperament (Slabach, Morrow, & Wachs, 1991). Temperament appears to be relatively stable over time with correlations for the same temperamental dimension over time ranging from .20 to .40 (Rothbart, 1989b; Slabach et al.), and as high as .80 when adjusted for measurement error (Pedlow, Sanson, Prior, & Oberklaid, 1993).

Contemporary temperament research has largely originated from the work of Thomas and Chess (Thomas & Chess et al.; Thomas, Chess, Birch, Hertzig, & Korn, 1963), who made the distinction between ability (the how of behavior), or the "tools" that are available to work with, and motivation, or what drives the use of these tools (the why and what of behavior) (Goldsmith, et al., 1987). According to this conceptualization, motivation, cognition, arousal, and emotionality are all part of temperament. Based on data from the New York Longitudinal Study (NYLS; Thomas & Chess et al., 1963) of caregiver report of temperament for infants 2 to 6 months of age, from the multiplicity of proposed temperament traits, nine behaviorally based categories of temperament were proposed: distractibility, persistence/attention span, adaptability (ability to adapt to environmental changes), approach/withdrawal (response to novel situations; similar to inhibition and disinhibition used by other theorists), activity level, intensity of mood expression (degree of reaction to environment), quality of mood (negative or positive), sensory threshold (degree to which environmental events are experienced), and rhythmicity (regularity of sleeping, eating, etc.).

Broad qualitative categories including "difficult", "easy", "slow-to-warm-up" and "task-oriented" have also been offered to describe types of temperament in children based on this research (Thomas & Chess et al., 1963; 1968). Based on the NYLS, Thomas, Chess, and

colleagues (1963) characterized temperamental "easiness" as approachability, adaptability, regularity, mild or moderate reactivity, and positive mood. Temperamental "difficulty" was described by withdrawal, low adaptability, arhrythmicity, intense reactivity, and negative mood. Their concept of difficultness was found to be predictive of poorer adjustment later in childhood (Thomas & Chess, 1977). In later analyses however, Bates (1989) found that these traits reported to correspond with "difficulty" actually failed to cluster together. Consequently, researchers typically use their own clusters when defining temperamental difficulty.

More recently Rothbart and Bates (1998) have proposed a comprehensive theory of temperament that has grown in popularity, integrating many shared components from existing theoretical work. According to this theory, temperament comprises biologically based individual differences in *reactivity* and *self-regulation*, with "reactivity" and "self-regulation" acting as inclusive terms describing broad physiological processes. Reactivity is expressed in the onset, duration and intensity of emotional, attentional and motor reaction (both positive and negative expression) to both internal and external stimuli, while self-regulation (also termed executive control in other research; for the purposes of this study, executive control will refer to a factor derived from the temperament measurement used) serves as the "control center" for this reactivity (Rothbart & Derryberry, 1981).

Rothbart and colleagues (Putnam, Ellis & Rothbart, 2001; Rothbart, 1989a; Rothbart & Bates, 1998; Rothbart & Derryberry, 1981) have examined the stability and measurement of temperament across the lifespan. Temperamental traits may be behaviorally expressed very differently in infancy when compared to later childhood or adolescence. For example, an infant or toddler may show fear when first encountering an unknown person; however, an older child would be much more likely to exhibit fear of social rejection in peer groups. However, to be

considered a component of temperament, there should be consistency over time in the same dimension. Although temperamental traits have been categorized and defined in many divergent ways, Rothbart and Bates have articulated three global temperament factors based on studies from infancy through adolescence as follows: executive control, surgency, and negative affect. Surgency and negative affect have been documented from infancy through adolescence, while executive control has been identified from toddlerhood through adolescence.

Executive control (which may alternatively be referred to as self-regulation or effortful control in temperament literature) is a system for the "regulation" of temperament, serving as the neuro-cognitive moderator of both temperamental approachability and negative mood. Executive control is conceptualized as effortful control, or self-regulation, of both attention (persistence, non-distractibility) and emotion (self-soothing). According to Rothbart and Bates (1998), the earlier emerging form of executive control, behavioral inhibitory control of action and emotion develops during the first year of life. Later emerging executive attentional control, however, does not fully develop until the beginning of the preschool years. Rothbart points out that not only are both processes essential for the evolution of social and cultural expectations and conscience development, but importantly, problems in either system may be linked to potential behavior disorders (Kochanska, 1991; Rothbart & Bates).

Surgency (which may also be referred to as approach-withdrawal, positive reactivity, temperamental inhibition, or sometimes, sociability) comprises traits such as smiling, laughter, high intensity pleasure, and positive vocalizations. Surgency describes the degree to which children approach or withdraw, the degree of expression of positive reactivity, and the degree of temperamental inhibition or sociability in novel situations. For example, children high in each of these aspects of surgency would tend to be impulsive in unfamiliar situations, exhibiting high

positive affect and high approach tendencies. Conversely, children low in surgency tend to approach novelty more cautiously, or perhaps not at all, showing low expression of positive affect and a propensity to withdraw from unfamiliar situations and people.

Negative affect (alternatively labeled as negative emotionality or reactivity) is comprised of negative behavioral and attentional reactions to environmental stimulation. Distress proneness to both limitations (irritability, anger) and distress to novelty (fearfulness) are encapsulated within negative affect, which includes the dimensions of discomfort, fear, anger and frustration, and sadness, and an inverse relationship with soothability. General distress proneness is the earliest emerging form of environmental reactivity; ontogenetically later is negative reactivity to novelty and limitations (fear and frustration).

In an effort to understand the fundamental components of temperament, research has focused on themes of individual differences in temperament. Typically, this research has conceptually concentrated on a unidirectional path of influence from temperament to specific developmental outcomes. However, more researchers are beginning to examine various ways in which temperament may mediate developmental factors to affect these developmental outcomes. Such research may be particularly vital in the exploration of various temperamental characteristics associated with behavior problems. To begin with, most forms of psychopathology appear to have some genetic component (Bouchard & Lochlin, 2001) and furthermore, it appears that this genetic risk may be interconnected with individual differences in emotional processing, or temperament (Izard, Fine, Mostow, Trentacosta, & Campbell, 2002). In studies of general childhood adjustment examining the occurrence of childhood disorders and the development of conscience, as well as individual differences in positive behaviors, it is noteworthy that relationships between temperament and adjustment have been well documented.

(For reviews see Bates, 1989; Rothbart, Posner, & Hershey, 1995; Sanson et al., 2004.)

Temperament research began as a way of identifying children at risk for problem behaviors in childhood, and this tradition continues in temperament research today. According to Rothbart and Bates (1998), there are four theoretically plausible pathways by which temperament could influence the development of behavior disorders. First are *direct linear effects*, such that a disorder is simply the extreme expression of temperamental traits. For example, conduct disorder is characterized by traits such as aggression and irritability, traits that also typify the temperamental aspect of negative emotionality. Second, through an *indirect linear effect* temperament may influence the environment in a way that increases the risk for behavior problems. For instance, the precarious combination of an irritable child and a coercive parent may easily result in aggressive behavior on the part of the child. A t*emperament by temperament interaction effect* is also possible, in which temperamental self-regulatory abilities could mediate the expression of other temperamental components. In other words, a child high in self-regulation and high in approach tendencies would have a very different behavioral expression of temperament when compared to a child high in approach but low in self-regulation. Lastly, a *temperament by environment interaction effect* implies that temperament can work as either a protective or a risk factor in the world of developmental behavior problems. Children high in negative emotionality and reactivity tend to generally react poorly to environmental stressors, whereas children high in adaptability and positive affect may be buffered against the same stressors. That is, individual differences are more salient during stressful, intense circumstances, such that most children are competent in non-stressful environments; however, children high in negative emotionality tend to show deficits in social skills (Eisenberg et al., 1993; Fabes et al., 1999). Thus, in line with the goodness of fit model, temperament may influence developmental

tasks along any of these paths, thereby affecting social developmental outcomes.

Social Development

Typically, social development refers to the social, behavioral and emotional domains subsuming social competence, internalizing and externalizing behavior problems, as well as more specific components such as parent-child and child-peer relations (Sanson et al., 2004). Social development can be broadly defined as the behaviors, feelings and attitudes children exhibit in their interactions with others, and the way in which these characteristics change with age (Schaffer 1996). Early behavior problems, both internalizing and externalizing, appear to be the best predictors of later behavior disorders and related problems (Bates et al., 1991; Prior, Smart, Sanson, & Oberklaid, 1993), and when appearing early in childhood have been shown to remain relatively stable into later childhood (Schmitz, Fulker, Emde, & Zahn-Waxler, 2001). According to Campbell and Ewing (1990), children considered hard to manage at 3 or 4 years of age had a 50% chance of continuing maladjustment in middle childhood and adolescence; moreover, 67% of "hard to manage" 6-year-olds showed DSM-III (Diagnostic and Statistical Manual of Mental Disorders, 1980) criteria for externalizing disorders at 9 years of age.

As a result of the work of Thomas, Chess, and colleagues (Chess & Thomas, 1984; Thomas & Chess, 1977; Thomas, Chess, et al., 1963, 1968), there is now a recognition of the child's own contribution to his or her social relationships such that social interaction is viewed as an event in which child and caregiver together direct and redirect the behavior of each other. These interactions will proceed based on the responsiveness, emotional state, and general understanding and abilities of both the parent and the child. Indeed, researchers, following upon the work of Thomas and colleagues, found that certain temperament traits were associated with

problem behaviors in preschoolers (Bates, et al., 1985; Sanson, Oberklaid, Pedlow, & Prior, 1991). Behavior problems are classified by externalizing and internalizing features (i.e., respectively, aggression, oppositionality and anger, anxiety, and depression). Importantly, externalizing behaviors, such as aggression, oppositionality, and anger have been associated with childhood behavior problems, including attention-deficit hyperactivity disorder, oppositional defiant disorder, conduct disorder, and disruptive behavior disorder. Relationships between temperament styles and conduct problems in school-age and adolescent children have also been documented (Caspi et al., 1994) in both boys and girls (Prior et al., 1993).

However, as Rothbart and Bates (1998) point out, one of the problems arising when investigating and conceptualizing temperament and social development, or behavior problems, is in finding the line of demarcation between these two constructs. Some would argue that they are the same construct (recall Rothbart's direct linear effects discussed previously), that behavior problems are merely an extreme expression of temperament (Clark, Watson, & Mineka, 1994). On the other hand, if temperament and behavior problems are considered separate constructs, the issue becomes one of measurement, as they share many of the same features. Furthermore, it may be more difficult to explain the differences between the two, if they are part of the same construct, in which case, the definition of one or the other would potentially need to be correspondingly adjusted (Frick, 2004). Nonetheless, the few studies that have addressed this problem have found that temperament is still associated with behavior problems, after controlling for this overlap (Lemery, Essex & Snider, 2002).

Several dimensions of temperament have been specifically related to internalizing behavior problems. Infant negative emotionality has been found to predict inhibition in toddlerhood, which in turn predicts childhood internalizing behavior problems. In fact early

behavioral inhibition appears to increase the risk for later global internalizing problems (Biederman et al., 2001). Furthermore, highly reactive infants were found to show more fear and inhibition to unfamiliar events than infants low in reactivity. These children were more likely to be inhibited and withdrawn at 4 years and to have anxiety symptoms at 7 years (Kagan & Snidman, 1999). Schwartz and colleagues (Schwartz, Snidman, & Kagan, 1999) found that 61% of those classified as inhibited toddlers showed symptoms of social anxiety compared with those classified as uninhibited, of whom only 27% showed social anxiety symptoms. This research indicates that temperamental reactivity and inhibition may be importantly related to internalizing behavior problems, although other researchers have failed to find similar associations between reactivity and inhibition and later anxiety. In the longitudinal Australian Temperament Project, involving over 2,000 infants, Prior and colleagues (Prior, Smart, Sanson, & Oberklaid, 2000) reported that high reactivity did not increase the risk for anxiety in adolescence. However, shyness, especially when enduring over time, was found to modestly increase the risk for later anxiety; among children described as shy more than once between infancy and late childhood, 42% reported anxiety problems as adolescents. Nevertheless, only 1 out of 5 adolescents reporting anxiety problems had been persistently shy as an infant or child. Temperamental unadaptability and anxiety have also been linked to internalizing behavior problems (Bates et al., 1991), as have problems in regulating sadness (Eisenberg et al., 2001).

A large body of research links temperament and externalizing behavior disorders (for reviews see Rothbart & Bates, 1998; Sanson & Prior 1999). In fact, temperamental difficulty, particularly difficulties in emotion regulation and the lack of fearful inhibition, may be particularly indicated in the development of conduct problems in preschool, childhood, and adolescence (for a review see Frick & Morris, 2004). Negative reactivity, or affect, has been

associated with externalizing behavior problems. Early negative affect, poor self-regulation, and impulsivity broadly correlate with externalizing behavior problems (Prior, Smart, Sanson, & Oberklaid, 1993).

Temperament appears not only to have an important association with behavior problems but also with social relationships and social skills more generally. Positive social functioning (sociability and adaptability) seems to protect children from later difficulty (for a review see Sanson et al., 2004), whereas low sociability appears to increase the risk for both externalizing and internalizing behavior problems (Sanson et al., 2004; Schmitz et al, 2001). Attention regulation, sociability, and reactivity have been identified as predictors of social skills at 11 and 12 years of age, while longitudinal predictors include task orientation and flexibility (attentional and emotional self-regulation) (Prior et al., 2000). High task orientation and low reactivity have been associated with positive socialization and flexibility towards both teachers and peers. In boys, low sociability is a risk factor for depression, whereas for girls this relationship is moderated by social support (Schmitz et al., 2001). Schmitz and colleagues also reported that high negative emotionality increased the risk for low social skills in boys and girls, while low negative emotionality served as a protective factor for boys. Children who are highly emotional and poorly regulated seem to have the lowest social skills and peer sociometric status.

The social relationships children experience may influence and be influenced by their own behavior problems. Peer rejection may be a risk factor for later social and conduct problems (Coie, Lochman, Terry, & Hyman, 1992) and has been found to be comorbid with behavior problems in preschoolers (Milich, Landau, Kilby, & Whitten, 1982). The capacity for emotion regulation and understanding is also prominently implicated in social adaptive functioning. Children able to understand emotions and who evidence prosocial behaviors are more liked by

their peers (Denham, McKinley, Couchoud, & Holt, 1990). Keane and Calkins (2004), in a longitudinal study of externalizing behaviors in 2-year-olds, found that measures of aggression, social skills, and emotion regulation predicted how well children were liked by their peers in kindergarten, although these results were differentially mediated by other behaviors based on gender (aggression in boys, sharing and sneaky behaviors in girls). Context also appears to have a moderating effect such that individual differences in temperament are more influential in generally stressful or intense circumstances. For example, preschoolers in rejected and neglected groups showed more negative mood and less adaptability in school than did popular peers (Walker, Berthelsen, & Irving, 2001).

Social experience and functioning are also differentially influenced by temperament based on the interactive relationship between the child's temperament and the characteristics of the social situation itself. Lab assessed measures of fearfulness negatively predicted mother's report of impulsivity, activity, and aggression and positively predicted susceptibility to guilt and shame, both of which are important factors in socialization (Rothbart et al., 1995). Highly reactive children who had higher rates of externalizing behavior problems at age 4 had received poorer parenting (characterized by low parent warmth, high punishment and low inductive reasoning) than children who were also highly reactive but who didn't show behavior problems (Hemphill & Sanson, 2001). It may be that during social interaction, children with traits of temperamental difficulty are perceived as intentionally difficult, rather than as exhibiting behavior that is a consequence of intrinsic characterology.

In reviewing research on the relationship between child temperament and parenting, Putnam Sanson and Rothbart (2002) concluded that children with high levels of arousal respond most adaptively to gentle discipline, whereas children who tend to be fearless react more

positively to responsive parenting strategies capitalizing on rewards. Temperamental factors appear to influence other areas of social development as well. Rubin et al. (2002) theorize that inhibition gives children fewer opportunities to interact with peers, particularly if they have overprotective parents. Furthermore, the development of conscience in young children, that is, the successful internalization of conscience, seems to be hindered in toddlers low in behavioral inhibition (Kochanska, 1991).

Although it seems clear that a connection exists between aspects of temperament and social development, very little is known about the mechanisms underlying this relationship. Also noteworthy, is the emerging awareness of the potential importance of the role of both social development and temperament in language development. Difficulty in language ability has often been referred to in studies of both temperament and language. However, the significance and specifics of this relationship are only just beginning to be more closely examined.

Language

Although there are considerable individual differences, most normally developing children seem to proceed through language development along a relatively typical pathway. From birth, infants pay attention to speaking voices, coo, and babble (typically around four to five months), begin combining several syllables, until finally, the first productive words emerge at about twelve months (Fenson et al., 1993). Two-word combinations appear between 21 and 24 months, quickly expanding the expressive vocabulary (Bates et al., 1988). Growing evidence indicates that normally developing children use lexical operating principles, or strategies, that enable language acquisition to proceed. These mental strategies, such as fast mapping, in turn operate alongside social-cognitive and stylistic language cues (Mervis & Bertrand, 1994). Socio-

pragmatic or cognitive associative principles also appear to contribute to word learning ability (Hollich et al., 2000; Locke, 2001).

Importantly, despite the apparently typical sequence there are distinct individual differences in the rate of early language development. In one study, 13-month-old infants' productive vocabularies ranged from none to 45 words (Snyder, Bates, & Bretherton, 1981). In another study of productive vocabulary in normally developing 20-month-olds, the number of words produced ranged from 8 to 434 words (Tamis-LeMonda & Bornstein, 1990). As result of this wide disparity, other developmental domains have been investigated as possible sources for these individual differences.

One logical source for these differences is the heritable, or biological, differences in the ability to learn language. However, only about 10-12% of children's vocabulary scores are accounted for by parent's vocabulary scores; furthermore, correlations between the vocabulary scores of adopted parents' and their children is comparable to that of biological parents' and their children, which points to the importance of environmental influences (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991).

In this regard, temperamental differences may also help explain individual differences in language development. According to Bloom (1993), emotion and language arise from a common cognitive source, such that during a state of heightened emotional arousal, either positive or negative, resources available to language acquisition processes might be compromised; likewise, during neutral emotional states, full cognitive abilities could be directed to language learning. Empirical evidence supporting this theory has appeared somewhat contradictory in terms of demonstrating that lack of emotionality facilitates language development.

Research supports a link between language development and temperament (Dixon &

Shore, 1997; Dixon & Smith, 2000; Kubicek et al., 2001; Morales, et al., 2000; Slomkowski, Nelson, Dunn, & Plomin, 1992). Dixon and colleagues (Dixon & Shore; Dixon & Smith) reported that positive affect, longer attention span, adaptability, and soothability at 13 months were associated with larger vocabulary size 7-8 months later. Similarly, Slomkowski et al. (1992) found that more positive affect/extraversion at age 2 predicted greater language proficiency at age 7.

Language also appears to be associated with social developmental outcomes. For example, considerable research supports the link between behavior problems and language delay. As a result, language deficits may be seen as a risk factor for later behavior problems, and behavior problems may send up a red flag for potential language delays. Stevenson, Richman, and Graham (1985) reported that behavior problems at 3 years of age predicted not only deviance at 8 years of age, but also poorer language performance. Hyperactive, hard to manage children at age 3 have been shown to be more likely to show behavior problems, poor academic performance and poor language skills in later childhood and early adolescence (McGee et al.,1996). In a comparison of speech and language impaired children with non-impaired peers, McCabe and Meller (2004) found that children with speech and language problems had lower parent ratings of self-control, higher scores for internalizing behaviors, and lower teacher ratings of assertiveness. Language delay has also been linked to other social developmental outcomes, including other kinds of psychopathology (Baker & Cantwell, 1987; Beitchman et al., 1990; Schmitz et al., 2001). In a study of 600 children, ages 2 to 6 years from a community speech clinic, 50% met the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) criteria for psychiatric disorders (Baker & Cantwell).

One way of conceptualizing the pathway between temperament and language outcome

would be to examine other variables common to both constructs. A review of the relevant literature suggests that at least one such factor may be joint attention. Joint attention has been implicated as a factor in language development (Carpenter et al., 1998; Morales et al., 2000; Mundy & Gomes, 1998; Sigman & Kasari, 1995; Smith & Ulvund, 2003); in turn, temperament has been associated with language development, as well as with joint attention (Vaughan et al., 2003). Finally, language development, temperamental difficulty, and joint attention (Sheinkopf et al., 2004) have been related to behavior problems. Consequently, the present goal is a closer inspection of the intermediary role of joint attention in the relationship between temperament and language development. The ability and propensity to engage in joint attention may be directly influenced by child temperament. In this way, children's success in joint attentional interaction may place them at a word learning advantage, while for another child, an inability or disinterest in joint attention may create a word learning disadvantage. Thus, the present study will focus on joint attention as a temperamentally driven individual and social component of developmental outcome, specifically of language development.

Joint Attention

Three broad areas of nonverbal social communication have been described by Bruner and Sherwood (1983). Within this larger framework of nonverbal social-communication skills, the following behaviors have been identified as follows in normally developing 9-12 month-olds: 1) social interaction and communicative behaviors for turn-taking routines (e.g., a child may throw a ball towards a caregiver to initiate taking turns throwing the ball back and forth); 2) requesting using gestures or protoimperatives to direct attention to elicit aid in obtaining objects (e.g., a child points or gestures or uses eye contact in order to obtain a toy that is out of reach); and 3)

joint attention using gestures or protoimperatives to direct attention in order to share the experience of an object or event with another person (e.g., child points to a ball or a barking dog). Importantly, this latter piece of nonverbal communication, the phenomenon of joint, or shared, attention appears to be an important component in the human experience of language development and communication.

In recent years joint attention has become an active and promising area of investigation (Baldwin, 1995; Bakeman & Adamson, 1984; Carpenter et al., 1998; Dunham & Moore, 1995; Markus et al., 2000; Mundy, Fox, & Card, 2003; Scaife & Bruner, 1975; Smith & Ulvund, 2003; Tomasello & Farrar, 1986; Vaughan et al., 2003). This specialized form of attention begins to evolve as a child first shares eye-to-eye gaze with a parent and develops as child and parent both coordinate their attention toward a common object. Joint attention is conceptually defined as social interaction in which two individuals simultaneously coordinate visual attention to an object or event, with the important qualification that both individuals must be aware of the shared attention. Joint attention behaviors fall into two basic categories: first, *responding* to joint attention (RJA) by following the direction of eye gaze, head turn, or pointing gesture of a social partner (Mundy, Hogan, & Doehring, 1996), and second, *initiating* joint attention (IJA) by pointing at or alternating gaze between an interesting object or event and a social partner (Mundy et al., 1996). Joint attention is most often operationally defined either by the amount of time spent in mutual object engagement or by experimentally tested skills (i.e., the ability to follow eye gaze or pointing).

Scaife and Bruner (1975), in a seminal study, first described the tendency of infants as young as 2 months to follow the gaze of an adult in an early operationalization of joint attention. Researchers following upon that early work have reported that by the time of their first birthday,

children can typically both follow and direct (by pointing) the visual attention of adults (Corkum & Moore, 1995; Scaife & Bruner) and can participate in episodes of joint attention (Bakeman & Adamson, 1984). During the first year, infants have a limited ability to visually differentiate; however, toward the end of the first year, infants first begin to discriminate between more than one possible target, can find a target outside their immediate visual space, and can follow pointing gestures (Butterworth, 1995). At the end of the first year, children begin to use social referencing (Walden & Ogan, 1988), imitative learning (Meltzoff, 1988), and intentional communication (Bates et al., 1988).

Nevertheless, there has been some disagreement regarding the age at which joint attention first appears. Some researchers report evidence of joint attention as early as 6 months (Butterworth & Cochran, 1980; Butterworth & Grover, 1990; Butterworth & Jarrett, 1991; Scaife & Bruner, 1975), whereas others using a more stringent operational definition do not report joint attentional skills until 12 months of age (Corkum & Moore, 1995; Lempers, 1979). Nonetheless, the primary period for the development of joint attention appears to be from 9- to 12-months of age, with consolidation of joint attentional skills occurring at around 12 months of age (Morales et al., 2000), though some researchers indicate consolidation may occur as late as 18 months of age (Adamson & MacArthur, 1995; Smith & Ulvund, 2003; Tomasello, 1995). For example, Tomasello (1995) contends that fully functioning joint attention (true social-cognitive joint attention) is not possible until the infant is first capable of recognizing others as intentional agents, that is, as having intentions and behaviors that may be different from the infant's own intentions and behaviors.

The ability to see other people as intentional agents, to understand behaviors as having an effect on the environment, is considered by some to be the hallmark of joint attention and a

precursor to the development of theory of mind (Baron-Cohen, 1991). A variety of social-cognitive skills including social referencing, gestural communication, imitative learning, and acquisition and use of language emerge at roughly the same time (Tomasello, 1995). The capacity to understand others as intentional agents signals an underlying change in cognition allowing the infant to attribute meaning to the behavior of others, an important step in learning to understanding one's own and other's behavior, which is in turn essential for appropriate social understanding.

Baron-Cohen (1995) describes a Shared Attention Mechanism (SAM) that enables the infant to recognize that he and another person are both looking at the same object, through a process called triadic representation (see Bakeman & Adamson, 1984). According to this model, triadic representation (which most often occurs visually but may also work through touch or sound in children who are blind) is the interplay among Self, Agent, and Object (or Self, Agent, and another Agent). For example, "I see [Mommy sees the ball], and Mommy sees [I see the ball]" or "I see [Mommy sees Daddy], and Mommy sees [I see Daddy] " and so forth (Baron-Cohen, 1995). It is important to distinguish between mere "onlooking" (i.e., watching mommy looking at the ball) (Bakeman & Adamson) and actual joint attention, which has the added component of shared of attentional focus. In this way, because both individuals are aware of the other's common attention to a common object or event, communication is possible.

Individual differences across contexts result in normal individual variation in the expression of joint attention. However, some individuals evidence marked deficits in joint attention abilities. Children with autism, in particular, show significant deficits. Although children having disorders falling on the autistic spectrum appear to be as responsive as normally developing children to joint attention bids by others, there is a deficit in their ability to initiate

joint attention other than for the purpose of requesting aid (Sigman & Kasari, 1995). Looking at other people's faces for information or assurance is a typical part of normal development and social interaction. Autistic children, however, rarely do this. In a study by Sigman, Kasari, Kwon, and Yirmiya (1992) in which adults evidenced either fear or amusement at the appearance of a robot, few if any autistic children looked at either the parent or the experimenter. Autistic children also typically fail to respond to the emotions of others. When exposed to an adult pretending to hurt him or herself, autistic children ignored the adult after a fleeting glance, playing with the toy in front of them, compared with normally developing children, who could not shift their attention from the "injured" adult. Furthermore, autistic children who use joint attention seem to be more likely to learn language skills than autistic children who do not (Mundy, Sigman, & Kasari, 1990; Sigman & Kasari, 1995).

Joint attention, then, appears to be an especially crucial factor in language as well as cognitive and social development in typically (Baldwin, 1995; Carpenter et al,, 1998; Dunham & Dunham, 1992; Dunham, Dunham, & Curwin, 1993; Morales, et al., 2000; Mundy & Gomes, 1998; Sigman & Kasari, 1995; Smith & Ulvund, 2003; Tomasello & Farrar, 1986) and atypically developing children (Mundy et al., 1990; Sigman & Ruskin, 1999; Ulvund & Smith, 1996). Importantly, joint attention is believed to be central to learning and language development in the 18 to 24 month period (Tomasello, 1995). For example, to learn new words children must participate in joint attention with adults, which may require shifting of their own attention to the attentional focus of the adult. Baldwin has demonstrated that when an 18-month-old child and an adult are looking at two different objects, and the adult uses a novel word, the child will learn the label for the object the adult is looking at, as opposed to the object he or she is looking at when the label is used. It is significant that as children begin participating in more extended periods of

coordinated visual attention, they also begin to acquire language (Tomasello & Todd, 1983). Associations between individual differences in joint attention and language have been found. Morales et al. (2000), in a longitudinal study of joint attentional behaviors from 6 to 24 months, found that responding to joint attention at 6, 8, 10, 12 and 18 months positively predicted vocabulary development, although joint attention at 21 and 24 months was not predictive of vocabulary. Several studies have also demonstrated that the amount of time spent sharing attention predicts later vocabulary development, as well as IQ (Carpenter, et al.; Desrochers et al., 1995; Dunham et al., 1993; Markus et al., 2000; Mundy & Gomes, 1998; Tomasello & Farrar, 1986; Ulvund & Smith).

Individual differences in language based on caregiver directing versus following attentional focus have also been reported. Mothers who follow their children's focus of attention have children with larger vocabularies, compared with mothers who redirect their children's focus of attention (Tomasello & Todd, 1983). As well, joint attention may differentially impact receptive and expressive vocabulary development. For example, Mundy and Gomes (1998) found, that among 16-month-old infants, responding to joint attention was related to receptive language development, while initiating joint attention was predictive of expressive language at 16 week follow up; other research has found similar results (Mundy et al., 1995; Vaughn et al., 2003), pointing to the potential role of social-environmental factors in the development of joint attention. Therefore, though RJA and IJA both seem to be related to language development (Ulvund and Smith, 1996), the relationships may not be exactly equivalent.

These reported individual differences in joint attentional abilities have been hypothesized to be the result of individual differences in the maturation of social-cognitive processing systems (Mundy et al., 2003; Tomasello, 1995). Cognitive ability has been shown to influence the

duration and quality of joint attention (Markus et al., 2000). Mundy found that EEG and joint attention measures at 14 months were significantly correlated with individual differences in language at 24 months (Mundy et al., 2003). Mundy and colleagues also suggest that the dorsal medial-frontal cortex and the anterior cingulate may play a role in disturbances in joint attention ability. Initiation of joint attention has been linked to the medial frontal brain system, which is responsible for the integration of social cognition, executive functioning and positive affective-orientation, while responding to joint attention has been connected to parietal systems, which mediate attentional control that is less volitional. This research also indicates that different psychophysiological correlates may underlie IJA and RJA processes (Mundy, 2003).

However, while it seems likely that some portion of the individual differences in joint attention would be the result of underlying biological ability, to the extent that temperament also reflects underlying biological ability, aspects of temperament may be used to predict aspects of joint attention ability. Bruner (1983) hypothesized that joint attention may provide the basis for the shared experience that is necessary for language learning to occur. According to Hollich's emergentist coalition model of word learning (Hollich et al., 2000), during the first year of life children follow attentional cues such as perceptual salience and novelty; by the end of the first year, children begin to rely more heavily on social cues such as eye gaze and social context; finally, children are guided by linguistic cues. In this way, success in language acquisition seems to be directly related to the efficacy and expression of the child's joint attention skills, which in turn are the result of successful social interaction, all of which may be traced to individual differences in children's temperament.

Consequently, there are good reasons to expect that social aspects of joint attention may be temperamentally mediated, such that individual differences in joint attention may be partially

a function of individual differences in child temperament. Vaughan et al. (2003) investigated the influence of temperament and caregiver behavior on infant joint attention at 9 and 12 months. Positive emotional reactivity was related to IJA in 9-month olds, while negative emotional reactivity has been related to IJA at 12-months. In this same study, happy 9-12 month-old infants were found to engage in more joint attention initiation, while fearful infants engaged in more alternating joint attention. Other research has provided additional evidence of a connection between positive affect and joint attention, to the degree that joint attention seems to involve socioaffective sharing of positive affect (Bakeman & Adamson, 1984; Kasari, Sigman, Mundy, & Yirmiya, 1990; Mundy, Kasari, & Sigman, 1992). Infants considered temperamentally "easy" were more socially responsive to interaction and vocalization than infants rated as temperamentally "difficult" (Wachs & Gandour, 1983). In addition to positive emotionality, inhibition has also been related to joint attention (Morales et al., 2000; Slomkowski et al., 1992).

In this way, the interaction between child temperament and the social environment may form the foundation for language development. Perhaps joint attention is the piece of the puzzle that explains the apparent connection between individual differences in temperament and language development. According to Tomasello (1995) to learn new words, a child must understand and appropriately use new words. Therefore, in order to learn a new word the child must participate in joint attention. If the child is an equal partner in joint attentional episodes (Markus et al., 2000: Tomasello & Todd, 1983), it would then follow that individual differences in temperament would play in important and prominent role in the duration, quality, and frequency of joint engagement.

Children differ in their ability to participate, maintain, and initiate joint attention, in their social awareness and skill, and their interest in other people. These differences may be traceable

to temperamental sources. For example, children who are considered temperamentally "easy", who are temperamentally approachable, more persistent, and less fearful may be more likely to have more enduring and more frequent periods of joint attention and may demonstrate more initiating and responding behavior and, as a result, may be inclined to benefit from word-learning opportunities. Conversely, children who are temperamentally "difficult", who are inhibited, withdrawn, distress-prone, or distractible may be at a disadvantage. According to Sigman and Kasari (1995), joint attention involves information processing and emotional responsiveness. Bruner (1975) suggests that child-caregiver joint attentional episodes operate according to a specific, regular, and stereotyped "format" (i.e. mother and infant create a story book reading "script" of sorts for looking at and labeling pictures); in this way, the infant learns not only about patterns of communication but also about social and cultural functioning. Sameroff and Chandler's transactional model (1975) suggests that infants with more frequent initiation of social interaction may be more likely to create optimal learning environments in their social interaction with caregivers compared with infants who initiate interaction less frequently. Thus, for the temperamentally difficult child, diminished joint attentional capabilities may be a reflection of difficult temperamental characteristics (negative mood, fussiness, withdrawal) which together result in poorer social interactions, and, hence, significant word learning disadvantages.

Empirical evidence supports these latter possibilities. Bloom (1993) reported that as the infant progressed from positive emotionality to more negative emotionality, mothers moved from maintaining the child's goal to a more directive role, even abandoning the infants goal altogether. Therefore, as children exhibit more negative emotionality the quality of joint attention would theoretically be sacrificed (cf. Tomasello & Todd, 1983). Mothers have also been shown to be

more likely to socially reinforce happy emotion and interest than to reinforce fear in infants (Maletesta et al., 1986). Consequently, more approachable, happy infants may have the advantage of experiencing longer duration and/or higher quality interactions, facilitating their language learning.

Bloom and Tinker (2001) have described an Intentionality Model for language development that highlights the importance of degree of *engagement* and *effort* in the language learning process. In other words, the interplay between the amount of arousal, motivation, and responsiveness (engagement) together with the level of cognitive development or cognitive resources available (effort) determines whether or not language learning will occur. The implication is that children who are motivated to participate in social/communicative exchanges and who also have greater cognitive resources to bring to the table would be at a communicative and language learning advantage.

In this way type and amount of input a child receives may also vary as a result of differences in child temperament. Huttenlocher et al. (1991) found that infants who received more input (maternal talk) had larger expressive vocabularies. More positive affect and extroversion may lead to an increase in the amount of social interaction (greater engagement), leading to an increase in the amount of maternal talk, resulting in a larger vocabulary size; in other words, temperament may facilitate sheer input. Furthermore, the quality of the interaction may be affected by infant temperament. According to a review by Schaffer (1984), episodes of joint attention are typically the result of the mother following the infants' attention. Mothers may be more or less inclined to do so based on child temperament. Recent evidence supports the idea that mothers adjust the way in which they interact with their children based on the child's cognitive and temperamental abilities (Dixon & Smith, 2003). To the degree that joint attention

is about background knowledge and learning formats for interaction, children with temperamental difficulty would be at a disadvantage, as they may be less likely to participate in or have as frequent experience in these episodes, and are therefore less primed for joint attention and episodic learning.

Tomasello (1995) argues that joint attention is inherently intentional, and therefore, a child's ability to understand others as intentional also, will determine his or her respective development of social-cognitive skills, including social referencing, gestural communication, imitative learning, and acquisition and use of language. According to one theory, joint attention is a reflection of basic social skills, an assimilation of processes such as self-regulation, cognition, and emotion (Mundy, 2003; Mundy & Sheinkopf, 1998; Sheinkopf et al., 2004). This may also factor into other social developmental outcomes, particularly the development of behavior problems.

In a recent study examining joint attention in children who had been exposed to cocaine during the prenatal period, Sheinkopf et al. (2004) reported that joint attention (IJA and RJA) assessed at 12, 15, and 18 months was related to behavioral outcomes at 36 months after controlling for language and cognitive ability. Specifically, both IJA and RJA were negatively associated with disruptive behavior disorders. Higher reports of positive social behaviors were related to higher RJA; however, IJA was negatively related to positive social behavior. It may be that deficits in joint attention or decreased ability to participate in joint attention would have very significant effects on social interaction. For example, without social responding (RJA) as an acknowledgement of his or her presence or communication, a social partner may feel ignored or frustrated, which would make further communication less likely if not impossible. Other researchers have indicated a relationship between joint attention and social-emotional behavioral

development (Adamson & MacArthur, 1995; Goldsmith & Rogoff, 1997; Mundy & Gomes, 1998; Mundy & Willoughby, 1996; Raver & Leadbeater, 1995) and suggested that joint attention skills may interact with and influence social cognitive abilities (Baldwin, 1995; Baron-Cohen, 1995; Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Bretherton 1991; Tomasello, 1995).

Present Study

Although past research suggests an interactive relationship among joint attention, temperament, and language acquisition, the nature of this relationship is unknown. Therefore, the present study will examine the possibility that children with aspects of temperamental difficulty demonstrate diminished joint attention as well as the likelihood that children with aspects of more positive, "easygoing" temperament engage in more joint attention. The role of temperament will be separately examined in its relationship with both joint attention and language as will the concurrent relationship between joint attention and language. Finally, the role of temperament as a mediator in the relationship between language and joint attention will be explored. In summary, it is suggested that temperament may impact joint attention ability, and this in turn may be the pathway by which joint attention skills impact language acquisition.

Hypotheses

1. In replication of previous research, it is expected that infant temperament will predict measures of vocabulary production and acquisition (Dixon & Shore, 1997; Dixon & Smith, 2000; Kubicek et al., 2001; Morales et al., 2000; Slomkowski et al., 1992). Infants exhibiting aspects of temperamental difficulty are predicted to have lower scores on measures of language. Accordingly, infants with aspects of more positive, easygoing temperament are predicted to have higher proficiency.
2. Also as a replication of previous research, it is anticipated that infant joint attention will predict vocabulary production and acquisition (Desrochers et al., 1995; Markus et al., 2000; Mundy et al., 1995; Mundy & Gomes, 1998; Tomasello & Farrar, 1986; Tomasello & Todd, 1983; Ulvund & Smith, 1996), such that infants exhibiting more frequent initiation of and response to joint attention are expected to have higher scores on language measures.
3. Additionally, as an extension of other research, it is predicted that joint attention will be related to temperament (Bakeman & Adamson, 1984; Kasari et al., 1990; Morales et al., 2000: Mundy et al., 1992; Slomkowski et al., 1992; Vaughn et al., 2003; Wachs & Gandour, 1983). It is expected that infant temperament will be predictive of the frequency of joint attention initiation and response behaviors; specifically, infants higher in aspects of temperamental difficulty are predicted to have fewer episodes of joint attention, because of disruptions and/or an inability to successfully interact with their environment (although infants higher in temperamental fearfulness were expected to have more joint attention alternates). Conversely, infants with aspects of more easygoing temperament are predicted to have more frequent joint attention as a result of the greater possibilities for participating in joint attention.

4. Finally, joint attention is predicted to mediate the relationship between temperament and language. Therefore, exploratory analysis will be conducted to test the nature of the association among temperament, language, and joint attention.

CHAPTER 2

METHOD

Participants

For this study, 21-month-old toddlers were recruited through birth announcements placed in local newspapers. A total of fifty-one participants were drawn from a rural Appalachian community, 98% Caucasian in ethnicity. Demographics are presented in Table 1. Child and caregiver participated in a session conducted at the infant studies laboratory on the campus of a local university. Parents were requested to schedule their visit for a time during which their child would typically be alert and wakeful.

Table 1.

Demographic Information

Demographic	**n**	**%**
Male	21	41
Female	30	59
Caucasian	50	98
Other Ethnicity	1	2
Accompanied by Mother	48	94
Accompanied by Father	3	6

	M	***SD***
Age in Months	21.35	.59
Household Income	67,671	42,310

Design and Procedure

Prior to their visit, parents received by mail the Early Childhood Behavior Questionnaire (ECBQ; Putnam et al., 2001) and the MacArthur-Bates Communicative Development Inventory (MBCDI; Fenson et al., 1994). These parent-report questionnaires were collected at the time of the visit. One caregiver (94% mothers, 6% fathers) remained with his or her child during the entire session.

Children were given the opportunity to acclimate to the setting, while parents gave informed consent to participate in the study, followed by an initial warm-up task using Bert and Ernie dolls. Independent testers blind to children's temperament status administered a one-hour session, approximately 8 minutes of which was devoted to joint attention specific tasks. Within this larger experimental protocol, for the purposes of this study, children were administered laboratory tasks to assess joint attention/nonverbal social communication, using the Early Social-Communication Scales (ESCS, Abridged; Mundy et al., 2003). The order of tasks presented to each child followed a randomized design, with 24 possible experimental orders. For the tasks assessed, children remained seated on their parent's lap at a table oriented towards the experimenter who sat slightly to the child's right but directly in the child's line of vision. All objects were presented directly in front of the child on the table.

The laboratory space used for this study was dedicated specifically for the purpose of data collection in infant and child research. The study took place in a room measuring approximately 3 meters by 4 meters. The room contained a testing table and a cabinet holding the stimulus materials. Audio/video recording capabilities included two Kalatel Cyber Dome color cameras in opposite corners of the lab, controlled by Kalatel Keyboard and Joystick Controllers in an adjacent room; a Crown CMS60 hanging microphone in the center of the room

recorded sound. All audio-video recordings were monitored in the adjacent control room by Panasonic CD-1388YD 13" color monitors, routed through a Videonics MX-1 digital video mixer, a Behringer UB802 audio mixer, and a Tec Nec TDG-2001 Time/Date stamper. The mixed video/audio signal was monitored on a third Panasonic color monitor and recorded onto digital video disc through a Panasonic DMR-E30K DVD recorder.

Measures of Temperament

For the purpose of this study, temperament was conceptualized following the theory and research of Rothbart and Bates (1998).

Early Childhood Behavior Questionnaire

The Early Childhood Behavior Questionnaire (ECBQ short form; Putnam, et al., 2001) provided parent report of temperament. The 201 items describe daily behaviors such as naptime (i.e., "When told that it is time for bed or a nap, how often did your child (a) react with anger or (b) get irritable?") and peer interactions (i.e., "When approaching unfamiliar children playing, how often did your child (a) watch rather than join in, (b) approach slowly, or (c) seem uncomfortable?"). For each of the items, responses could range from 1 ("never") to 7 ("always"). The ECBQ details 18 fine-grained temperamental scales including activity level, fear, shyness and sociability (see Appendix A for ECBQ scales and definitions), which can then be mapped onto three broad temperamental factors – Surgency, Negative Affect, and Executive Control (Putnam et al., 2001). (See Table 2 for ECBQ scales and factor loadings.)

These three broad factors have been cross-culturally identified as remaining stable in studies of infants, children, and adolescents (Putnam et al., 2001, 2002; Rothbart, Chew, & Gartstein, 2001). Parent report of temperament has been found to be a reliable assessment of

temperament (Rothbart & Bates, 1998) and has the added advantage that parents are likely to have the best and widest access to observing their children's temperamental expression (Putnam et al., 2001). Furthermore, the high degree of agreement between the self-reported temperament of adolescents and their parents' report has provided increased support for the validity of this measurement.

Table 2.

Early Childhood Behavior Questionnaire: Temperament Scales and Factor Loadings

ECBQ Scales	Surgency	Negative Affect	Executive Control
Activity Level	++		-
Affiliation			++
Attention			++
Attentional Shifting			++
Discomfort		++	
Fear		++	
Frustration/ Distress to Limitations		++	-
High Intensity Pleasure	++		
Impulsivity	++		
Inhibitory Control			++
Low Intensity Pleasure			++
Motor Activation		++	
Perceptual Sensitivity		++	+
Positive Anticipation	++		+
Sadness		++	
Shyness	-	++	
Sociability	++		
Soothability		--	+

Note: "++" indicates a positive primary loading; "--" indicates a primary negative loading; "+" indicates a secondary positive loading; "-" indicates a secondary negative loading.

Qualitative Description of Temperament

Because researchers have used various methods for defining temperamental difficulty, for the present study, aspects of temperamental difficulty will be conceptualized by mapping past dimensions of temperament that have been related to aspects of difficulty onto ECBQ scales. Past research has implicated several temperamental components as having an important relationship with language development, including attention span, positive affect, adaptability and soothability, and threshold of responding (Dixon & Smith, 2000; Slomkowski, 1992). Additionally, temperamental positive reactivity, happiness, and fear have been implicated in the expression of joint attention (Bakeman & Adamson, 1984; Kasari et al., 1990; Morales et al., 2000; Mundy et al.,1992; Vaughn et al., 2003). Rothbart and Bates (1998) have described temperament as both reactivity and self-regulation. Given that, and taking these reported relationships into consideration, in the present study the comparable ECBQ temperament scales will be conceptually classified along three temperamental dimensions, in addition to the overarching ECBQ factor level dimensions of executive control, surgency and negative affect. These conceptual temperamental dimensions will be as follows: 1) self-regulation, 2) positive emotionality, and 3) negative emotionality.

The following ECBQ scales will be considered as components of temperamental *regulation:* attention, attentional shifting, inhibitory control, and the overarching factor of executive control. Temperamental *positive emotionality* (the degree of positive emotional reactivity/expression) will be defined by: high intensity pleasure, low intensity pleasure, affiliation, positive anticipation, and the factor surgency. *Negative emotionality,* the qualitatively opposite end of the spectrum compared to positive emotional expression, will include the following: fear, frustration, sadness, perceptual sensitivity, discomfort,

soothability (which loads negatively), and the broad factor termed negative affect. Table 3 outlines these qualitative classifications.

Table 3.

Hypothesized ECBQ Relationships with Temperamental Regulation and Reactivity

ECBQ Dimension	***Regulation***	***Positive Emotionality/ Reactivity***	***Negative Emotionality/ Reactivity***
Executive Control	✓		
Attention	✓		
Attentional Shifting	✓		
Inhibitory Control	✓		
Low Intensity Pleasure		✓	
Affiliation		✓	
Surgency		✓	
High Intensity Pleasure		✓	
Positive Anticipation		✓	
Sociability		*	
Impulsivity	*		
Activity Level	*		
Negative Affect			✓
Fear			✓
Frustration			✓
Sadness			✓
Perceptual Sensitivity			✓
Discomfort			✓
Soothability	✓		
Motor Activation	*		
Shyness			*

* Indicates a scale that for the present study was not hypothesized to have a relationship (based on previous research) which if included would conceptually fall along this dimension.

Defining Aspects of Temperamental Difficulty and Temperamental Easiness

Aspects of temperamental difficulty were qualified as follows: low executive control, low attention, low attention shifting, low inhibitory control, high negative affect, high fear, high frustration, high sadness, high perceptual sensitivity, high discomfort, and low soothability. Aspects of temperamental easiness were considered as follows: surgency, high intensity pleasure, low intensity pleasure, affiliation, and positive anticipation.

Executive control along with underlying scales was expected to dichotomously qualify children as "low in executive control" and, therefore, temperamentally difficult, or "high in executive control" and temperamentally easygoing. High negative emotionality was considered to be temperamental difficulty and low negative emotionality was considered temperamental neutrality, so that either temperamental outcome overall would be possible. High positive emotionality was similarly conceptualized. The expected relationships with temperamental difficulty and temperamental easiness that were examined in the present study are outlined in Table 4.

Table 4.

Defining Aspects of Temperamental Difficulty and Easiness Based on Dimensions of the ECBQ

ECBQ Dimension	***Temperamental Difficulty***	***Temperamental Easiness***
Executive Control	*Low*	*High*
Attention	*Low*	*High*
Attentional Shifting	*Low*	*High*
Inhibitory Control	*Low*	*High*
Low Intensity Pleasure+	*N*	*High*
Affiliation+	*N*	*High*
Surgency	*?*	*?*
High Intensity Pleasure	*?*	*?*
Positive Anticipation	*?*	*?*
Negative Affect	*High*	*N*
Fear	*High*	*N*
Frustration	*High*	*N*
Sadness	*High*	*N*
Perceptual Sensitivity	*High*	*N*
Discomfort	*High*	*N*
Soothability	*Low*	*N*

+ These ECBQ scales are expected to be associated with aspects of positive emotionality including dimensions of surgency
"N" indicates an expected neutral relationship with the particular temperamental aspects
"?" Indicates a relationship with an unspecified direction of influence

MacArthur-Bates Communicative Development Inventory

As with temperament, measures of language productivity were obtained from parent report at the time of the child's visit using the MacArthur-Bates Communicative Development Inventory, Words and Sentences version (MBCDI; Fenson et al., 1994). The MBCDI toddler version yields measures of productive vocabulary for children between 16 and 30 months of age. From a series of word lists ("Words Children Use"), including nouns, action lists, and animal sounds, parents are asked to choose the words that their child uses. This instrument has been typically used in clinical and research settings to quickly assess language production and has demonstrated high internal consistency and test-retest reliability (Fenson et al., 1994). Based on a review of studies examining the validity of parent report of child vocabulary in general and the validity of the MBCDI specifically, Fenson et al. (1994) concluded that the MBCDI reliably assesses a more complete range of vocabulary production than either laboratory observation or structured laboratory measures. Summary scores of children's language proficiency were derived from the MBDCI as shown in Table 5.

Table 5.

Language (MBCDI) Summary Score Descriptions

Summary Score	***Description***
Nouns	*Summary of MBCDI Noun Categories*
Predicates	*Summary of MBCDI Verb and Adjective Categories*
Closed class	*Summary of MBCDI function word categories including prepositions, time words, pronouns, question words, articles, auxiliary verbs, and conjunctions*
Composite Vocabulary Score	*Sum of Nouns + Predicates + Closed Class Words*
Morphology	*Summary of regular and irregular noun plurals and verb conjugations*
Complexity	*Summary of MBCDI complexity items*
MLU	*Mean Length of Utterance* *Average length of morphemes per utterance.*

Note: Based on the MBCDI; Fenson et al., 1993.

Early Social Communication Scales

Recall that joint attention has been conceptually defined as social interaction between two individuals simultaneously coordinating visual attention to an object or event, in which both individuals are aware of the shared attention. In the present study, joint attention was operationally defined as a discrete set of observed nonverbal behaviors either to elicit social attention/communication or behaviors in response to a partner's attempts at social attention/communication.

The Early Social Communication Scales (ESCS, Abridged; Mundy et al., 2003) was adapted for the present study to assess joint attention behaviors, by examining eye contact and gestural communication. The ESCS has been used to measure early social communicative development for children 8 to 30 months of age (e.g., Mundy et al., 1998, 1994, 1995; McEvoy et al.,1993; Ulvund & Smith, 1996). Behavioral frequency scores on two dimensions of joint attention were obtained: Initiating Joint Attention (IJA) and Responding to Joint Attention (RJA). Further descriptions are presented in Table 6.

Table 6.

Early Social Communication Scales Dimensions and Descriptions

Responding to Joint Attention (RJA)
Responding to the Joint Attention Bids by following the direction of eye gaze, head turn, or pointing gesture of a social partner
Initiating Joint Attention (IJA)
Initiating Joint Attention Bids by pointing at, or alternating gaze between an interesting object or event and a social partner

Note: Based on the ESCS; Mundy et al., 2003.

Among the three categories of nonverbal social communication skills the ESCS has been designed to assess, only joint attention (IJA and RJA) was assessed for the purpose of this study because these measures of nonverbal social communication were previously shown to predict language. Behaviors were coded for either frequency of occurrence, or the ability to achieve on experimentally presented tasks (i.e., the ability to follow pointing during the Picture Book Task). Table 7 outlines each joint attention behavior and the task during which each behavior was coded.

Table 7.

Joint Attention (ESCS) Behaviors

	RJA	***IJA***	***ESCS Task***
Eye Contact Child makes eye contact with the Experimenter during the task		✓L	Picture Book
Alternates (Referencing) Child looks between the toy and the Experimenter		✓L	Attractive Toy
Points Child points to picture		✓H	Picture Book
Point with Eye Contact Child points to picture while making eye contact with the Experimenter.		✓H	Picture Book
Follows Points Child looks at the picture the Experimenter points at	✓		Picture Book

"L" indicates developmentally lower (or earlier emerging behaviors)
"H" indicates more developmentally advanced (later emerging) behaviors
Note: Based on the ESCS; Mundy et al., 2003.

Two ESCS tasks were adapted and presented to each child as follows:

Picture Book Task

The Book Presentation Task assessed both IJA and RJA behaviors. For this task, a picture book (with several large, brightly, colored pictures on each page) was displayed in front of the child. The experimenter allowed the child to explore the book uninterrupted for approximately 20 seconds. If the child spontaneously pointed to pictures in the book, the experimenter responded naturally and briefly (e.g., "I see"). After the initial 20 seconds elapsed, the experimenter began pointing to pictures, using the child's name while pointing. On each page, up

to four pictures were pointed out by the experimenter, with each consecutive picture being some distance from the previous picture, so that the shift in visual focus could be easily observed. This process was repeated for each page in the picture book.

Attractive Toy Task

The Attractive Toy Task was designed to elicit IJA alternating behaviors. During the portion of this task that was scored for JA an attractive wind up toy (Gary the Snail) was shown to the child. The experimenter wound the toy and placed the toy out of the child's reach to "run" across the table in front of the child, again remaining responsive to any JA behaviors. If the child reached for the toy, the tester then allowed the child to play with the toy for approximately one minute. Alternatively, if the child did not reach for the toy, the experimenter gave the toy to the child to play with as well.

Joint Attention Coding

Joint attention was scored by a team of coders for all participants using *Noldus Observer* (version 5.0), a software system for scoring and analyzing behavioral data. All disagreements between coders were resolved by a third individual. Frequency data on previously described joint attention behaviors were obtained from Noldus and then exported for further analyses.

Joint Attention Summary Scores

Summary scores for all joint attention behaviors were created based on frequency data as described in Table 8.

Table 8.

Description of Joint Attention (ESCS) Summary Scores

Summary Scores	
IJA Eye Contact	Scored as frequency of Eye Contact with the Experimenter Coded during the initial, undirected portion of the Picture Book Task (Experimenter not pointing or engaging child)
IJA Alternates	Scored as frequency of Alternating gaze between active toy and Experimenter Coded while toy was available to child
IJA Points	Scored as frequency of occurrence of pointing to pictures Coded as all pictures points that were not immediately proceeded by an Experimenter point to the same picture
IJA Points with Eye Contact	Scored as frequency of occurrence of pointing to pictures while making Eye Contact Coded as all pictures points that were not immediately proceeded by an Experimenter point to the same picture
Lower IJA	Occurrence of lower level joint attention behaviors Scored as frequency of Eye Contact + Alternates
Higher IJA	Occurrence of higher level joint attention behaviors Scored as sum of Points + Points with Eye Contact
Total IJA	Scored as sum of Higher IJA + Lower IJA
Composite IJA (C-IJA)	Tendency to engage in Higher IJA behaviors relative to tendency to engage in all IJA behaviors Scored as Ratio of Higher IJA / Total IJA
RJA Point Follows	Scored as frequency of looks to pictures Experimenter points towards Coded during directed portion of Picture Book Task, as Experimenter points to individual pictures

Note: Based on the ESCS; Mundy et al., 2003. C-IJA score based on Mundy & Gomes, 1998.

CHAPTER 3

RESULTS

Preliminary analysis revealed no significant relationship of child's gender with measures of interest and thus was excluded from further analyses. Means and standard deviations for temperament, language, and joint attention measures are reported in Tables 9, 10, and 11, respectively. The sample data were compared to normative data for ECBQ and MBCDI measures; normative ESCS data for 21 month olds were not available. Toddlers in the present study were at the mean for language and slightly above the mean for the temperamental scales of attention and attentional shifting. Families in the present study were about 50% above the mean on socioeconomic status (SES) compared to the normative samples for ECBQ and MBCDI data. However, because measured scores for both of these factors were comparable to the normative data, SES was excluded from further analyses. For all other variables in the present sample, no significant differences from the normative samples were observed.

Table 9.

Means and Standard Deviations for Temperament

ECBQ Dimension	***M***	***SD***
Activity Level	*4.37*	*.84*
Attentional Focusing	*3.93*	*1.02*
Attentional Shifting	*4.75*	*.63*
Affiliation	*4.63*	*.75*
Discomfort	*2.22*	*.83*
Fear	*2.20*	*.74*
Frustration	*3.20*	*1.05*
High Intensity Pleasure	*4.71*	*.91*
Impulsivity	*4.76*	*.77*
Inhibitory Control	*3.75*	*1.02*
Low Intensity Pleasure	*5.05*	*.94*
Motor Activation	*2.10*	*.73*
Perceptual Sensitivity	*4.27*	*1.18*
Positive Anticipation	*4.57*	*1.05*
Sadness	*2.56*	*.85*
Shyness	*3.05*	*1.07*
Sociability	*5.79*	*.95*
Soothability	*5.18*	*.72*
Surgency	*5.54*	*.79*
Negative Affect	*3.08*	*.83*
Executive Control	*6.17*	*.90*

Note: N=49 for available ECBQ data.

Table 10.

Means and Standard Deviations for Language

MBCDI Dimension	***M***	***SD***
Sound Effects & Animal Sounds	*8.89*	*3.00*
Animals	*19.91*	*13.62*
Vehicles	*6.74*	*4.38*
Toys	*8.23*	*5.58*
Food & Drink	*27.85*	*22.16*
Clothing	*9.94*	*7.51*
Body Parts	*13.19*	*8.23*
Small Household Items	*19.17*	*16.18*
Furniture & Rooms	*10.02*	*10.10*
Outside Things	*11.17*	*8.76*
Places to Go	*5.72*	*6.25*
People	*10.83*	*6.09*
Games & Routines	*13.11*	*6.45*
Action Words	*25.55*	*26.32*
Descriptive Words	*16.96*	*17.80*
Words about Time	*1.91*	*2.63*
Pronouns	*4.02*	*4.42*
Question Words	*.94*	*1.54*
Prepositions and Locations	*5.34*	*6.00*
Quantifiers & Articles	*2.17*	*2.76*
Helping Verbs	*2.36*	*4.35*
Connecting Words	*.30*	*.66*
Referring to past events & people not present	*1.16*	*.80*
Talking about something that is going to happen	*.93*	*.72*
Talking about objects that are not present	*1.48*	*.72*
Understanding location of things not in the room	*1.89*	*.32*
Labeling an item in reference to its owner	*1.72*	*.54*
Word Endings “s”	*.83*	*.80*
Word Endings “ ’s”	*1.04*	*.87*
Word Endings “ing”	*.54*	*.78*
Word Endings “ed”	*.24*	*.60*
Word Forms – Nouns	*1.49*	*1.02*
Word Forms – Verbs	*2.34*	*4.28*
Word Endings – Nouns	*.79*	*1.25*
Word Endings – Verbs	*1.17*	*3.43*
Combining Words	*1.26*	*.73*
Complexity of Language	*27.85*	*23.84*
Nouns	*115.06*	*83.39*
Predicates	*42.51*	*42.78*
Closed class Words	*17.04*	*20.82*
Morphology	*8.57*	*10.71*
Total Language (Nouns + Verbs + Predicates)	*174.62*	*140.61*
Mean Length of Utterance (MLU)	*3.02*	*1.81*

Note: N ranges from 43 to 47 for available MBCDI data.

Table 11.

Means and Standard Deviations for Joint Attention

ESCS Behavior	***M***	***SD***
IJA Eye Contact	*1.63*	*2.30*
IJA Alternates	*1.35*	*1.52*
IJA Points	*5.55*	*5.13*
IJA Points with Eye Contact	*.71*	*1.30*
Lower IJA (Eye Contact + Alternates)	*3.04*	*3.28*
Higher IJA (Points + Points with Eye Contact)	*6.25*	*5.74*
Total IJA	*9.52*	*6.51*
Ratio Higher IJA / Total IJA	*.64*	*.32*
RJA Ratio Points Followed	*.70*	*.20*

Note: N ranges from 45 to 51 for available ESCS data.

Correlations between joint attention measures are reported in Appendix B.

Temperament and Language

Factor score values calculated from the ECBQ normative data sample were used to compute factors for the current sample. The 18 ECBQ scales (i.e., impulsivity, inhibitory control, fear, etc.) were loaded onto three factors (executive control, surgency, and negative affect). As expected, language measures were significantly predicted by several dimensions of temperament. Correlations between temperament dimensions and indices of language are presented in Table 12.

Table 12.

Correlations Between Temperament and Language

Temperament	***Language***						
	Nouns	Predicates	Closed class	Total Vocabulary	Morphology	Complexity	MLU†
Executive Control	**.419**** .003	**.326*** .025	**.440**** .002	**.413**** .004	**.399**** .006	**.493**** .000	**.462**** .001
Attention	**.389**** .007	**.336*** .021	**.343*** .018	**.384**** .008	**.359*** .014	**.386**** .007	**.370*** .011
Attentional Shifting	**.371*** .010	.270 .066	**.359*** .013	**.356*** .014	**.302*** .041	**.428**** .003	**.473**** .001
Inhibitory Control	**.343*** .018	**.337*** .020	**.322*** .027	**.354**** .015	.284 .056	**.454**** .001	**.403**** .005
Low Intensity Pleasure+			.265 .072			**.297*** .043	
Affiliation+							
Surgency							
High Intensity Pleasure	**.288*** .049			.257 .081			
Positive Anticipation	**.347*** .017	**.297*** .042	**.373**** .010	**.352*** .015	**.320**** .030	**.318*** .030	**.335*** .023
Negative Affect		-.279 .058					
Fear	-.268 .069	-.249 .091					
Frustration	**-.292*** .047	**-.368*** .011	**-.314*** .032	**-.331*** .023	-.260 .081		**-.309*** .037
Sadness	-.262 .075	-.263 .074	-.280 .056	-.277 .060		**-.293*** .045	**-.337*** .022
Perceptual Sensitivity	**.330*** .024		**.294*** .045	**.288*** .049	**.419**** .004	**.316*** .031	.258 .084
Discomfort		-.267 .070	-.270 .066		-.246 .099		
Soothability							

Note: N ranges from 43 to 47 for available data.
† MLU indicates Mean Length of Utterance (See Table 4).
+ These scales were conceptually identified as clustering with dimensions of positive affect.
*Correlation is significant at the 0.05 level; **Correlation is significant at the 0.01 level.
All other reported correlations are significant at the $p < .10$ level.

Aspects of Temperamental Regulation and Language

Temperament executive control demonstrated a strongly predictive relationship with all language measures, including both vocabulary size and more developmentally advanced measures of language production such as morphology. At the factor level, executive control was strongly and consistently associated with all measures of language (with r up to .493, $p = .000$), so that toddlers with more regulation of temperament displayed higher scores across all measured aspects of language.

Scale level aspects of temperament executive control, attentional focusing, and attentional shifting were significant predictors of vocabulary production and morphology (ranging from $r = .336$, $p = .021$ to $r = .389$, $p = .007$ for attentional focusing, and $r = .302$, $p = .041$ to $r = .473$, $p = .001$ for attentional shifting). Children with lower attentional abilities had significantly smaller vocabularies and were less grammatically advanced in language production. Inhibitory control was found to be widely associated with language (from $r = .322$, $p = .027$ to $r = .454$, $p = .001$). Children with lower inhibitory control demonstrated poorer language ability across all measured dimensions, while low-intensity pleasure ($r = .297$, $p = .043$) was predictive of language complexity, and affiliation was not significantly correlated with any summary measures of language. Taken together, children better able to regulate emotional reactivity and attentional ability had significantly larger productive vocabulary and more developmentally advanced morphology.

Aspects of Temperamental Easiness and Language

The over-arching temperamental factor surgency was not significantly associated with any aspect of language measured. However, at the scale level, components of surgency that

related to language measures included high-intensity pleasure (r = .288, p = .049) which evidenced a moderate relationship with vocabulary production. The less pleasure experienced in high-intensity situations, the lower the reported language measures. Positive anticipation proved to be broadly predictive of both vocabulary and morphology (r = .297, p = .042 to r = .373, p = .010).

Aspects of Temperamental Difficulty and Language

Although the global negative affect factor was only found to be related to one aspect of vocabulary production ($\boldsymbol{r}$ = -.279, p = .058), there was a pattern of significant negative associations between scale level components of negative affect and measures of language (see Table 12).

Scale level aspects of negative affect found to be associated with aspects of vocabulary included fear (r = -.268, p = .069 to r = -.249, p = .091), frustration (r = -.292, p = .047 to r = -.368, p = .011), and sadness (r = -.293, p = .045 to r = -.337, p = .022). Toddlers with higher expression of each of these temperamental scales scored lower on measures of both vocabulary and morphology (with the exception of fear, which was related only to vocabulary production). Soothability was not associated with measured language.

Measures of discomfort (r = -.246, p = .099 to r = -.270, p = .066) and perceptual sensitivity (r = .288, p = .049 to r = .419, p = .004) were also related to language. Children higher in negative reactivity to sensory information displayed smaller vocabularies. Children displaying higher general reactivity (discomfort) also had lower vocabulary size and morphology.

Joint Attention and Language

Although previous research has reported a relationship between joint attention and language (Markus et al., 2000; Mundy et al., 1995; Mundy & Gomes, 1998; Tomasello & Farrar, 1986; Tomasello & Todd, 1983; Ulvund & Smith, 1996), some research has failed to find a relationship (Karrass, 2002). The present results indicate sporadic correlations between some aspects of joint attention and language measures. Given the number possible, however, these correlations are not above what would have been expected by chance.

Joint Attention and Temperament

Working from the temperamental dimensions hypothesized to underlie the association between temperament and language, the same dimensions were examined with respect to the propensity for joint attention engagement. It was expected that children higher in aspects of temperamental difficulty would have less frequent joint attention, whereas children higher in aspects of positive emotionality were predicted to have more frequent joint attention engagement. Correlations between temperament and both initiating and responding to joint attention are presented in Table 13.

Table 13.

Correlations Between Joint Attention and Temperament

Temperament	***IJA***							
	Eye Contact	*Alternates*	*Points*	*Points w/EC*	*Lower IJA*	*Higher IJA*	*Total IJA*	*C -IJA*
Executive Control		**-.379*** .010			-.290 .054			
Attention								
Attentional Shifting		-.290 .055						
Inhibitory Control		-.291 .053						
Low Intensity Pleasure+								
Affiliation+		-.260 .054						.289 .057
Surgency								
High Intensity Pleasure								
Positive Anticipation				**-.313*** .030				
Negative Affect			**.437**** .002			**-.417**** .003	**-.317*** .034	**-.364*** .015
Fear			**-.304*** .035			**-.309*** .032		-.262 .086
Frustration		**.315*** .035						-.254 .096
Sadness								
Perceptual Sensitivity		-.249 .100					**-.307*** .040	
Discomfort			**-.295*** .042			-.260 .074		
Soothability								

*Correlation is significant at the 0.05 level; **Correlation is significant at the 0.01 level. All other reported correlations are significant at the $p < .10$ level.

Initiating Joint Attention

Aspects of Temperamental Regulation. Several aspects of temperament executive control were found to be related to aspects of joint attention, albeit at a less rigorous significance level ($p < .10$). Interestingly, more frequent IJA alternates corresponded to lower attentional shifting ($r = -.290$, $p = .055$), lower inhibitory control ($r = -.291$, $p = -.291$, $p = .053$), lower affiliation ($r = -.260$, $p = .054$) and lower factor level executive control ($r = -.379$, $p = .010$). Toddlers displaying less affiliation also evidenced a lower proportion of higher level IJA behavior relative to total IJA behaviors (i.e., less frequent use of higher IJA communicative/attention sharing behaviors).

Toddlers low in executive control also displayed more frequent lower level joint attention engagement ($r = -.290$, $p = .054$) than toddlers high in executive control; recall that lower level joint attention subsumes earlier emerging, less developmentally mature forms of engagement. Toddlers less adept at monitoring emotional and attentional reactivity were also less adept at coordinating more developmentally complicated episodes of joint attention.

Aspects of Temperamental Easiness. Of the dimensions of surgency that were expected to be associated with IJA, only positive anticipation was found to be related to joint attention. Lower levels of positive anticipation ($r = -.313$, $p = .030$) were associated with fewer points with eye contact (higher level JA behavior). Among other dimensions contained within global positive emotionality, affiliation was found to be related to joint attention, as mentioned previously. The over arching factor of surgency was not related to any summary dimension of joint attention.

Aspects of Temperamental Difficulty. Compared to other temperamental dimensions, aspects of negative emotionality were more robustly related to joint attention. Toddlers low in frequency of joint attention gestures were generally higher in fear ($r = -.304$, $p = .035$) and

discomfort (r = -.295, p = .042). Again a differential relationship emerged with IJA alternates, in that higher frustration was predictive of higher frequency of alternates (r = .315, p = .035), as was higher perceptual sensitivity (r = -.249, p = .100). Toddlers higher in discomfort (r = -.295, p .042), fear (r = -.309, p = .032), and perceptual sensitivity (r = -.307, p = .040) displayed an overall pattern of less frequent higher level joint attention and fewer IJA points. Soothability was not related to joint attention.

Responding to Joint Attention

The degree to which toddlers successfully responded to joint attention bids by the experimenter was not found to be related to measures of temperament above what would be expected by chance.

Joint Attention as a Mediator

Because the present study failed to detect an association between individual differences in joint attention and language, further analyses of the role of joint attention within the larger process of the relationship between temperament and language were not possible. (See Appendix C for a comparison of temperamental components linked to language and joint attention.)

CHAPTER 4

DISCUSSION

The results of this study lend support to the growing literature demonstrating a link between individual differences in temperament and individual differences in language. Additionally, the present study adds to the existing literature indicating a relationship between temperament and joint attention. In contrast to earlier studies, present results do not appear to support the connection between joint attention and language in 21-month-old toddlers. The implications of these findings will be discussed in the context of the respective hypotheses that generated them.

Hypothesis 1: The Relationship Between Temperament and Language

In replication of previous research (Dixon & Shore, 1997; Dixon & Smith, 2000; Karrass, 2002; Kubicek et al., 2001; Morales et al., 2000; Slomkowski et al., 1992) infant temperament was found to be predictive of language. Aspects of temperamental difficulty were found to correspond with language delay (or relatively lower language productivity) including low executive control and high negative affect. Aspects of temperamental easiness including high executive control and higher surgency were predictive of better language productivity. Taken together, these results suggest that infants with aspects of temperamental difficulty displayed concurrently lower scores on measures of vocabulary and morphology. Conversely, children with aspect of temperamental easiness had higher language scores across the board as hypothesized.

Children higher in executive control are by definition more capable of controlling both

attention and emotion. Rothbart and Bates (1998) have described temperament as the interplay between reactivity and self-regulation (executive control). As such, executive control may operate as a filter determining the expression of temperament that will be behaviorally evidenced. In the realm of temperamental difficulty, children with weak executive control are highly reactive and are disadvantaged in the ability to modulate their own emotionality; the same is true in highly distracting environments. Therefore, in a language learning context, toddlers with deficits in the ability to regulate high emotionality and/or attention to distracting stimuli may be at a disadvantage in language learning.

At the scale level within temperamental executive control, aspects of attention were both across-the-board predictors of language productivity (vocabulary and grammar). Based on these results toddlers with greater attentional resources appear to be at a significant advantage with respect to their expressive language abilities. Recall that according to Bloom (1993), the allocation of sufficient cognitive resources was necessary for language learning to occur. Intuitively, it follows that those children better at maintaining an attentional focus, who can more easily shift their focus and suppress any off-task responses would be much more successful at learning generally and at language learning, specifically. For example, a toddler who is not distracted by a sibling as mother is directing his attention and labeling the colors in a picture book would have more cognitive resources available to learn the new color words than would a child who is less capable of maintaining attentional focus.

Bloom (1993) also suggests that emotion and language draw from a common cognitive pool of resources. Accordingly children's expressions of both positive and negative emotionality would draw on the same pool of resources available to language acquisition and, consequently, would be lacking during situations eliciting emotional expression; whereas during more

emotionally neutral states, full cognitive abilities could be allocated to language learning. Results from the present study only partially support Bloom's hypothesis. Although toddlers high in negative affect demonstrated poorer language abilities, toddlers with more expression of positive affect and surgency demonstrated *higher* language abilities.

In line with past research (Dixon & Smith, 2000; Karrass et al., 2003; Kubicek et al., 2001; Matheny, 1989; Slomkowski et al., 1992), aspects of positive emotionality were associated with language ability. In the present study, pleasure in expectation of enjoyable activities, along with the actual pleasure and positive mood expressed during a high intensity experience were predictive of better language ability. This makes sense because children more excited in anticipation of pleasurable experiences might be more likely to engage in the kinds of social interactions and communicative exchanges that would facilitate language learning. For example, happy children anticipating attending a birthday party might be more likely to engage in conversation than would children less excited (cf. Huttenlocher et al., 1991).

In general, research has shown that parents respond differently to children's emotionality. Bloom (1993) found that mother's play varies based on the expression of positive and negative emotion. Similarly, other research has found that mothers may interact differently with children based on the children's temperament (Dixon & Smith, 2003). Taken together with the present findings, which indicate a pattern of higher positive emotionality linked to better language, children with more positive temperamental expression may have more opportunities for word learning and/or more constructive word learning experiences. Simply being exposed to more language input may smooth the progress of language learning (Huttenlocher et al.,1991).

As expected, all dimensions of temperamental difficulty (except for low soothability) were collectively associated with all aspects of poorer language. Higher negative affect predicted

poorer language. Children higher in fear frustration, sadness, and discomfort, who in the present study were found to have less productive language may be less able to learn language, or may have more difficulty in doing so. Dixon and Smith (2000) have suggested that positive temperament may create long-term advantages so that negative emotion in the moment, if not expressed consistently across time, would not have the same impact as more generally occurring negative affect.

Results of the present study have shown that in addition to positive temperament predicting better language gains, aspects of negative emotionality predict language delay. This result is not an artifact of having bipolar dimensions of temperament. Dimensions that reflected positive emotionality did not necessarily reflect low negative emotionality and were in fact different dimensions than those reflecting negative emotionality (see Table 4).These findings suggest a reconceptualization of temperamental difficulty as the diametric opposite of temperamental easiness. Derryberry and Rothbart (1988) also found that aspects of positive and negative emotionality were not opposite poles of the same continuum. Therefore, in the present study, although positive temperament is linked to higher language scores and negative temperament is linked to lower language scores, this may be reflective of two distinct temperamental dimensions. It may be possible for an individual to be high in difficulty and in positivity, such that only the degree of difficulty would be reflective of difficulty in language.

Hypothesis 2: The Language and Joint Attention Question

Though indicated in previous research (Markus et al., 2000; Morales et al., 2000; Mundy & Gomes, 1998; Mundy et al., 1995; Ulvund & Smith, 1996), the results of this study did not provide support for a relationship between joint attention and language in 21-month-old toddlers.

Other studies have also failed to find this relationship between joint attention and language (Karrass, 2002), and still other studies have found only small to medium effects (Ulvund & Smith).

One reason for the lack of relationship in the present study might be that individual differences in joint attention in 21-month-olds were simply not predictive of concurrent language. Indeed, most studies have examined the relationship between individual differences in joint attention and language before 18 months of age. Although there is some debate, the complete range of joint attention skills appear to come under the control of the child sometime between 12 and 18 months of age (Adamson & MacArthur, 1995; Morales et al., 2000; Smith & Ulvund, 2003; Tomasello, 1995), and importantly, are believed to be used for learning and language development in the 18 to 24 month period (Tomasello). Though joint attention in late infancy might be predictive of language, joint attention in early toddlerhood has not been shown to be predictive of language and may not in fact maintain this predictive ability.

Although there are significant reports of the utility of early RJA as a predictor of later language (Desrochers et al., 1995; Morales et al., 2000; Mundy et al., 1995; Mundy & Gomes, 1998; Ulvund & Smith, 1996), later developing RJA may not have the same predictive ability. Morales et al. (2000), in a longitudinal study of 22 toddlers, reported that although RJA assessed at 6 to 18 months was predictive of individual vocabulary differences at 30 months, RJA at 21 and 24 months was not related to language development. The present results indicate this may also be the pattern with IJA as well. Therefore, it may be that in an older sample individual differences in joint attention are no longer predictive of language

Hypothesis 3: The Connection Between Temperament and Joint Attention

It was expected that temperamental dimensions of positive emotionality would be related to higher frequencies of expression of joint attentional behaviors (Bakeman & Adamson, 1984; Kasari et al., 1990; Morales et al., 2000; Mundy et al. 1992; Vaughn et al., 2003). The results of the present investigation do not provide support for a link between positive emotionality and joint attention, but they do provide evidence for a link between negative emotionality and language. Higher levels of negative affect were associated primarily with diminished frequency of joint attention behaviors.

Among aspects of self-regulation, toddlers lower in executive control engaged in more lower level IJA behaviors. This finding implies that children less able to regulate attention and emotion may also be less able to express more developmentally advanced forms of joint attention in that lower level JA behaviors are more often used. Toddlers low in executive control may have difficulty organizing and processing the social, emotional and cognitive demands that compete for resources during joint attentional engagement.

Dimensions of attention-regulation were also predictive of joint attention alternates. In this case, however, a differential relationship emerged so that children with higher levels of IJA alternates appeared to be an exception to the overall pattern in the relationship between temperament and joint attention engagement. Children exhibiting less regulation (less executive control, lower attentional shifting, lower inhibitory control, and less affiliation) displayed *more* IJA alternates. One reason may be that IJA alternates, or shifts of eye gaze between a toy and a person, do not necessarily involve the intent to communicate (Mundy & Gomes, 1998). Alternating may also be conceptualized as "referencing" or checking behavior. From this perspective, it makes sense that children high in fear and frustration would evidence frequent

occurrence of alternating behaviors. This becomes more plausible given that children higher in frustration also engaged in more frequent IJA alternates. Vaughn et al. (2003) also reported that infants higher in fear were higher in alternating joint attention. This pattern of connections between IJA alternates and temperament dimensions may indicate a developmentally earlier, less sophisticated form of attention sharing (if indeed attention sharing is the motive).

Overall, aspects of temperamental difficulty were associated with lower frequency of joint attentional engagement and less developmentally advanced forms of joint engagement. Children high in negative affect had relatively infrequent joint attention gestures and infrequent high-level joint attention engagement as well as less total joint attention overall. At the scale level, toddlers high in frustration (although exhibiting more IJA alternates) had fewer higher level IJA behaviors (indicating that higher frequency of alternates is not necessarily indicative of an overall higher frequency of joint attention). According to these results, it may be the case that children less able to regulate temperament who are also higher in negative emotionality may be more vulnerable to miss out on joint attention opportunities to begin with, and thereafter, less capable of participating in joint engagement.

The pattern between aspects of positive emotionality and joint attention was much simpler in that only two dimensions of positive reactivity (i.e., positive anticipation and affiliation) were found to have a relationship with joint attention. Children lower in positive anticipation had more frequent IJA gestures (points). Although children higher in positive anticipation were more advanced in language, these same children were actually less advanced in IJA gestures. It may be that more moderate expression of pleasure about exciting activities best facilitates joint attention. In other words, a child who can attend to nothing else in her excitement about attending a birthday party may not be able to focus the resources necessary to engage in

attention sharing. Although higher positive anticipation appeared to offer word learning advantages, the same does not appear to be true of joint attention. Therefore, there may be cases in which joint attention is not necessary for word learning to occur. This also suggests that although toddlers with more aspects of temperamental easiness and positive emotionality may have more normative levels of joint attention as a result of typical possibilities for eliciting social interaction, the addendum to this relationship may be that too much positive emotionality may push limited resources too far. In situations of very high positive emotional expression attention sharing and coordination may plateau, eventually becoming less possible.

Overall, toddlers using less frequent joint attention and less developmentally advanced joint attention were described by caregivers as high in aspects of temperamental difficulty. These toddlers were high in negative affect, high in reactivity to environmental stimulation, high in fear and frustration, and low in executive control. However, the relationships between joint attention and temperamental easiness and difficulty are not necessarily straightforward. For example, Morales et al. (2000) found that positive affect was more important in prediction of joint attention earlier in development, at 9 months of age, whereas negative affect became a better predictor later in development at 18 months.

Apart from potential differences in ability, further differences in expression of joint attention would arise from differences in the motivation and success of expression. Toddlers higher in negative emotionality may be less motivated (from a social cognitive motivation standpoint) to engage in attention sharing. It may also be that more temperamentally difficult children have fewer opportunities for joint attention episodes. As mentioned previously, caregivers may interact differently based on temperament (Dixon & Smith, 2003). The more emotionally negative the infant, rather than following the infant's attentional/communicative

goal, the more directive the caregiver may become (Bloom, 1993). As a result, joint attention opportunities may be compromised or even ignored. Recall that Bloom and Tinker (2001) have described an Intentionality Model for language development highlighting the importance of engagement and effort in the word learning process. Children more temperamentally motivated or advantaged to participate in social/communicative exchanges would have facilitated language learning episodes.

Surprisingly in the present study aspects of temperamental easiness were not found to be associated with the joint attention. It is unclear why aspects of temperamental negativity would be associated and temperamental easiness would not. Temperamental negativity may be more draining to cognitive/attentional abilities necessary for engaging in joint attention than would high expression of positive emotionality. Positive emotionality does not appear to have any draw on cognitive resources in that it neither adds to resources available nor does it seem to take away. Therefore, as with language, joint attention engagement may be disadvantaged by temperamental difficulty rather than advantaged by temperamental easiness in that toddlers higher in facets of temperamental difficulty may display less joint attention because of disruptions and/or the inability to successfully interact with their environment.

Conclusions: Temperament, Language, and Joint Attention in Context

Although the present study failed to find evidence for joint attention as a mediating variable in the relationship between temperament and language, this finding may be limited to this age group. Furthermore, because a relationship was not found between language and joint attention, the role of joint attention in this larger process could not be determined. Examining individual differences in joint attention in a younger population would be necessary to better

understand the nature of the relationships among temperament, language, and joint attention.

In the same way that temperament seems to drive the social interaction that is joint attention, temperament appears to influence social skills generally (Prior et al., 2000; Sanson et al., 2004; Schmitz et al., 2001). In fact, taken together in a cumulative risk model paradigm, children with aspects of difficult temperament and who would therefore potentially engage in less joint attention are at significant risk for not only language problems but also at risk for problems in social development broadly. In fact as reviewed earlier, temperament, language development, and joint attention have all been identified as relating to behavior problems (Sheinkopf et al., 2004). Sanson et al. (2004) suggest that positive social abilities serve as a general protective factor against adverse developmental outcomes. Early executive attentional control (persistence, non-distractibility) may serve as the necessary groundwork for many other developmental achievements (e.g., social skills, cognitive skills, conscience development) later in childhood (Kochanska, 1991; Rothbart & Bates, 1998).

For children and adults alike, successful social engagement rests on the ability to appropriately participate in social interaction, which in turn is dependent upon the capacity for social understanding and the ability to share an affective state with others. Social understanding and affective state sharing involve accessing, recognizing, and understanding the state of another individual. Sameroff and Chandler's transactional model (1975) suggests that infants with more frequent initiation of social interaction and attention sharing may be more likely to create optimal learning environments in their social interaction with caregivers, compared with infants who initiate interaction less frequently. Children who are temperamentally better at engaging in social interaction, better able to understand other's emotions and engage prosocially are more liked by their peer group (Denham et al., 1990; Keane & Calkins, 2004), whereas children who are less

able to regulate emotion and have fewer social skills are less liked by their peers (Keane & Calkins).

Joint attention as a foundational social engagement process seems to become central to larger social skills. As discussed in the introduction, this larger link to social developmental outcome is important to emphasize. The transactional model of developmental psychopathology describes the interaction between the environment and characteristics of the child. After a review of literature on conduct disorder in boys and girls, Lytton (1990) concluded that a vulnerability stress model best suited the data. That is, a biological predisposition is mitigated by either stressors or protective factors in the environment. "Niche-picking" in which the child finds an environment in which his or her temperamental tendencies can be expressed may also occur (Sanson & Prior, 1999). In other words, children bring to the table their respective temperament driven "strengths" and "weakness" which may be different based on the situation. The outcome is then determined by the manner in which the situation is played out. A toddler with high control of attention and emotional expression without a supportive environment to foster her apparent strengths may succeed no better than a child with little or no emotion and attention regulation but in an environment best adapted for his needs.

Historically, developmental and clinical researchers have followed disconnected lines of research. Developmental researchers have long shown interest in the mechanisms by which infants are initiated into the world of verbal communication, including the precursors to language acquisition and social-environmental conditions. Likewise, although measures of infant temperament were originally conceptualized as a means of assessing psychopathology, temperament research has largely remained within the purview of developmental researchers, and psychopathology tends to remain within the domain of clinical researchers. Despite this

traditional polarity, integration of this sort seems to be on the increase. Importantly, investigations examining the underlying developmental mechanisms contributing to various pathways of both normal and atypical development may be essential to understanding these collective relationships.

Limitations and Directions for Future Research

The present study sought to examine the role of joint attention in the processes underlying the relationship between temperament and language. These results suggest several possibilities for further consideration. Joint attention ability may no longer be a useful predictor of language ability (at least concurrently assessed language ability) at 21 months-of-age. Follow-up with later language assessment in these same children would be necessary to clarify this possibility. It would also be useful to consider the assessment of joint attention and nonverbal social communication in a less verbal population, before 18 months of age, as this is the age in which this relationship has been identified previously.

As described earlier, joint attention assessment in more typical, naturalistic settings including the possibility of distractions may yield additional useful information. Joint attention assessed within naturally occurring mother-child interactions may be very different that what is assessed in a structured task-oriented laboratory setting. Joint attention may be disproportionately affected by temperament in a laboratory setting, particularly with respect to assessing joint attention expression that would impact language learning. Most word learning likely occurs within the context of familiar caregivers. This possibility may have factored into the lack of relationship detected between joint attention and language.

REFERENCES

Adamson, L.B., & McArthur, D. (1995). Joint attention, affect, and culture. In C. Moore & P.J. Dunham (Eds.), *Joint attention: Its origins and role in development*. Hillsdale, NJ: Erlbaum.

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.

Bakeman, R., & Adamson, L. (1984). Coordinating attention to people and objects in mother infant and peer-infant interactions. *Child Development, 55*, 1278-1289.

Baker, L., & Cantwell, D.P. (1987). Factors associated with the development of psychiatric illness in children with early speech/language problems. *Journal of Autism and Developmental Disorders, 17*, 499-510.

Baron-Cohen, S. (1995). The eye detector (EDD) and the shared attention mechanism (SAM): Two cases for evolutionary psychology. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origins and role in development*. Hillsdale, NJ: Erlbaum.

Baron-Cohen, S. (1991). From attention-goal psychology to belief-desire psychology: The development of a theory of mind and its dysfunction. In H. Tager-Flusberg, S. Baron-Cohen, & D.J. Cohen (Eds.), *Understanding other minds: Perspectives from autism* (pp. 59-82). Oxford: Oxford University Press.

Baldwin, D.A. (1995). Understanding the link between joint attention and language. In C. Moore & P.J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 131-158). Hillsdale, NJ: Erlbaum.

Bates, J.E. (1989). Applications of temperament concepts. In G.A. Kohnstamm, J.E. Bates, & M.K. Rothbart (Eds.), *Temperament in childhood* (pp. 321-355). Chichester, England:

Wiley.

Bates, J.E., Bayles, K., Bennett, D.S., Ridge, B., & Brown, M.M. (1991). Origins of externalizing behavior problems at eight years of age. In D.J. Pepler & K.H. Rubin (Eds.), *The development and treatment of childhood aggression.* Hillsdale, NJ: Erlbaum.

Bates, E., Benigni, L., Bretherton, I., Camaioni, L., & Volterra, V. (1979). *The emergence of symbols: Cognition and communication in infancy.* New York: Academic Press.

Bates, J.E., Bretherton, I., Snyder, L., Beeghly, M., Shore, C., McNew, S., Carlson, V., Williamson, C., Garrison, A., et al. (1988). *From first words to grammar: Individual differences and dissociable mechanisms.* New York: Cambridge.

Bates, J.E., Maslin, C.A., & Frankel, K.A. (1985). Attachment security, mother-child interaction, and temperament as predictors of behavior problem ratings at age three years. *Monographs of the Society for Research in Child Development* (Serial No. 209), 167-193.

Beitchman, J.H., Hood, J., & Inglis, A. (1990). Psychiatric risk in children with speech and language disorders. *Journal of Abnormal Psychology, 18,* 283-296.

Biederman, J., Hirshfeld-Becker, D.R., Rosenbaum, J.F., Herot, C., Friedman, D., Snidman, N., et al., (2001). Further evidence of association between behavioral inhibition and social anxiety in children. *American Journal of Psychiatry, 158*, 1673-1679.

Bloom, L. (1993). *The transition from infancy to language: Acquiring the power of expression.* Cambridge, England: Cambridge University Press.

Bloom, L., & Tinker, E. (2001). The intentionality model and language acquisition: Engagement, effort, and the essential tension in development. *Monographs of the Society for Research in Child Development, 66*(4, Serial No. 267).

Bouchard, T.J., & Lochlin, J.C. (2001). Genes, evolution, and personality. *Behavior Genetics,*

31(3), 243-273.

Bretherton, I. (1991). Intentional communication and the development of an understanding of mind. In D. Frye & C. Moore (Eds.), *Children's theories of mind: Mental states and social understanding* (pp. 49-75). Hillsdale, NJ: Erlbaum.

Bruner, J.S. (1975). From communication to language: A psychological perspective. *Cognition, 3*, 255-287.

Bruner, J.S. (1983). *Child's talk: Learning to use language*. Oxford: Oxford University Press.

Bruner, J. S., & Sherwood, V. (1983). Thought, language and interaction in infancy. In J. Call, E. Galenson, & R. Tyson (Eds.). *Frontiers of infant psychiatry* (pp. 38-55). New York: Basic Books.

Buss, A.H., & Plomin, R. (1984). Temperament: Early developing personality traits. Hillsdale, NJ: Erlbaum.

Butterworth, G. (1995). Origins of mind in perception and action. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origins and role in development.* Hillsdale, NJ: Lawrence Erlbaum.

Butterworth, G., & Cochran, E. (1980). Towards a mechanism of joint visual attention in human infancy. *International Journal of Behavioral Development, 3,* 253-272.

Butterworth, G., & Grover, L. (1990). Joint visual attention, manual pointing, and preverbal communication in human infancy. In M. Jeannerod (Ed.), *Attention and performance XIII* (pp. 605-624). Hillsdale, NJ: Erlbaum.

Butterworth, G., & Jarrett, N. (1991). What minds have in common is space: Spatial mechanisms serving joint attention in infancy. *British Journal of Developmental Psychology, 9,* 55-72.

Calkins, S.D. (2002). Does aversive behavior during toddlerhood matter? The effect of difficult

temperament on maternal perceptions and behavior. *Infant Mental Health Journal, 23,* 381-402.

Campbell, S.B., & Ewing, L.J. (1990). Follow-up of hard-to-manage preschoolers: Adjustment at age 9 and predictors of continuing symptoms. *Journal of Child Psychology & Allied Disciplines, 31*, 871-889.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social Cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development, 63*, No. 4 (Serial No. 255).

Carson, D.K., Klee, T., Perry, C.K., Muskina, G., & Donaghy, T. (1998). Comparisons of children with delayed and normal language at 24 months of age on measures of behavioral difficulties, social and cognitive development. *Infant Mental Health Journal, 19*, 59-75.

Caspi, A., Moffitt, T.E., Silva, P.A., Stouthamer-Loeber, M., Krueger, R.F., & Schmutte, P.S. (1994). Are some people crime-prone? Replications of the personality-crime relationship across countries, genders, races, and methods. *Criminology, 32,* 163-195.

Chess, S., & Thomas, A. (1984). *Origins and evolution of behavior disorders.* New York: Brunner/Mazel.

Chess, S., & Thomas, A. (1991). Temperament and the concept of goodness of fit. In J. Strelau & A. Angleitner (Eds.), *Explorations in temperament: International perspectives on theory and measurement*. London: Plenum Press.

Cicchetti, D. & Cohen, D.J. (1995). Perspectives on developmental psychopathology. In D. Cicchetti & D.J. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and methods* (pp. 3-20). New York: John Wiley.

Clark, L.A., Watson, D., & Mineka, S. (1994). Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology, 103,* 103-116.

Cohen, N.J., Barwick, M.A., Horodezky, N., & Isaacson, L. (1996). Comorbidity of language and social-emotional disorders: Comparison of psychiatric outpatients and their siblings. *Journal of Clinical Child Psychology, 25*, 192-200.

Cohen, N.J., Menna, R., Vallance, D.D., Barwick, M.A., Im, N., & Horodezky, N.B. (1998). Language, social cognitive processing, and behavioral characteristics of psychiatrically disturbed children with previously identified and unsuspected language impairments. *Journal of Child Psychology and Psychiatry, 39*, 853-864.

Coie, J.D., Lochman, J.E., Terry, R., & Hyman, C. (1992). Predicting early adolescent disorder from childhood aggression and peer rejection. *Journal of Consulting & Clinical Psychology, 60*, 783-792.

Corkum, V., & Moore, C. (1995). Development of joint visual attention in infants. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origin and role in development.* Hillsdale, NJ: Erlbaum.

Coster, F.W., Goorhuis-Brouwer, S. M., Nakken, H., & Spelberg, H.C. (1999). *Folia Phoniatrica et Logopaedica, 51*, 99-107.

Denham, S.A., McKinley, M., Couchoud, E.A., & Holt, R. (1990). Emotional and behavioral predictors of preschool peer ratings. *Child Development, 61*, 1145-1152.

Derryberry, D., & Rothbart, M. K. (1988). Arousal, affect, and attention as components of temperament. *Journal of Personality & Social Psychology, 55*, 958-966.

Desrochers, S., Morisette, P., & Ricard, M. (1995). Two perspectives on pointing in infancy. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origin and role in development.* Hillsdale, NJ: Erlbaum.

Dixon, W.E., Jr., & Shore, C. (1997). Temperamental predictors of linguistic style during multiword acquisition. *Infant Behavior and Development, 20,* 99-103.

Dixon, W.E., Jr., & Smith, P.H. (2000). Links between temperament and language acquisition. *Merrill-Palmer Quarterly, 46,* 417-440.

Dixon, W.E., Jr., & Smith, P.H. (2003). Who's controlling whom? Infant contributions to maternal play behavior. *Infant and Child Development, 12,* 177-195.

Dunham, P.J.,& Dunham, F. (1992). Lexical development during middle infancy: A mutually driven infant-caregiver process. *Developmental Psychology, 28,* 414-420.

Dunham, P.J., Dunham, F., & Curwin, A. (1993). Joint attentional states and lexical acquisition at 18 months. *Developmental Psychology, 29,* 827-831.

Dunham, P., & Moore, C. (1995). Current theories in research on joint attention. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origins and role in development.* Hillsdale, NJ: Erlbaum.

Escalona, S.K. (1968). *The roots of individuality: Normal patterns of development in infancy.* Chicago: Aldine.

Eisenberg, N., Fabes, R.A., Bernzweig, J., Karbon, M., Poulon, R., & Hanish, L. (1993). The relations of emotionality and regulation to preschoolers' social skills and sociometric status. *Child Development, 64,* 1418-1438.

Eisenberg, N., Cumberland, A., Spinrad, T.L., Fabes, R.A., Shepard, S.A., Reiser, M., et al. (2001). The relations of regulation and emotionality to children's externalizing and

internalizing problem behavior. *Child Development, 72,* 1112-1134.

Fabes, R.A., Eisenberg, N., Jones, S., Smith, M., Guthrie, I.K., Poulin, R., Shepard, S., & Friedman, J. (1999). Regulation, emotionality, and preschoolers' socially competent peer interactions. *Child Development, 70*, 432-442.

Fenson, L., Dale, P.S., Reznick, J.S., Thal, D., Bates, E., Hartung, J.P., Pethick, S., & Reilly, J.S. (1993). *Technical manual for the MacArthur Communicative Development Inventory*. San Diego: Singular Press.

Fenson, L., Dale, P.S., Reznick, J.S., Bates, E., Thal, D.J., & Pethick, S. (1994). Variability in Early Communicative Development. *Monographs of the Society for Research in Child Development, 59 (5, Serial No. 242).*

Frick, P.J. (2004). Integrating research on temperament and childhood psychopathology: Its pitfalls and promise. *Journal of Clinical Child and Adolescent Psychology 33*, 2-7.

Frick, P.J., & Morris, A.S. (2004). Temperament and developmental pathways to conduct problems. *Journal of Clinical Child and Adolescent Psychology 33*(1), 54-68.

Goldsmith, H.H., Buss, A.H., Plomin, R., Rothbart, M.K., Thomas, A., Chess, S., Hinde, R.A., & McCall, R.B. (1987). What is temperament? Four approaches. *Child Development, 58,* 505-529.

Goldsmith, H.H., & Rieser-Danner, L.A. (1986). Variation among temperament theories and validation studies of temperament assessment. In G.A. Kohnstamm (Ed.), *Temperament discussed: Temperament and development in infancy and childhood* (pp. 1-9). Lisse, Switzerland: Swetz & Zeitlinger.

Goldsmith, D.F., & Rogoff, B. (1997). Mothers' and toddlers' coordinated joint focus of attention: Variations with maternal dysphoric symptoms. *Developmental Psychology, 33*,

113-119.

Hemphill, S., & Sanson, A. (2001). Matching parenting to child temperament. *Family Matters, 59,* 42-47.

Hollich, G.J., Hirsh-Pasek, K., Golinkoff, R.M. Brand, R.J., Brown, E., Chung, H.J., Hennon, E., & Rocroi, C. (2000). Breaking the language barrier: An emergentist coalition model for the origins of word learning. *Monographs of the Society for Research in Child Development, 59*(3, Serial No. 262).

Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: Relation to language input and gender. *Developmental Psychology, 27*, 236-248.

Izard, C.E., Fine, S., Mostow, A., Trentacosta, C., & Campbell, J. (2002). Emotion processes in normal and abnormal development and preventive intervention. *Development and Psychopathology, 14,* 761-788.

Kagan, J. (1994). Galen's prophecy: Temperament in human nature. New York: Basic Books.

Kagan, J., & Snidman, N. (1999). Early childhood predictors of adult anxiety disorders. *Biological Psychiatry, 46,* 1536-1541.

Karrass, J. (2002) Individual differences in temperament, joint attention and early language. (Doctoral dissertation, University of Notre Dame, 2002). Dissertation Abstracts International, 63(1-B), 566.

Karrass, J., & Braungart-Rieker, J. (2003). Parenting and temperament as interacting agents in early language development. *Parenting: Science and Practice, 3*, 235-259.

Kasari, C., Sigman, M., Mundy, P., & Yirmiya, N. (1990). Affective sharing in the context of joint attention interactions of normal, autistic, and mentally retarded children. *Journal of Autism & Developmental Disorders, 20*, 87-100.

Keane, S.P., & Calkins, S.D. (2004). Predicting kindergarten peer social status from toddler and preschool problem behavior. *Journal of Abnormal Child Psychology, 32*, 409-423.

Kochanska, G. (1991). Socialization and temperament in the development of guilt and conscience. *Child Development, 62*, 1379-1392.

Kochanska, G. (1997). Multiple pathways to conscience for children with different temperaments: From toddlerhood to age 5. *Developmental Psychology, 33*, 228-240.

Kubicek, L.F., Emde, R.N., & Schmitz, S. (2001). Temperament, mental development, and language in the transition from infancy to early childhood. In R.N. Emde & J.K. Hewitt (Eds.), *Infancy to early childhood: Genetic and environmental influences on developmental change.* New York: Oxford University Press.

Lemery, K.S., Essex, M.J., & Snider, N.A. (2002). Revealing the relation between temperament and behavior problem symptoms by eliminating measurement confounding: Expert ratings and factor analyses. *Child Development, 73*, 867-882.

Lempers, J.D. (1979). Young children's production and comprehension of nonverbal diectic behaviors. *Journal of Genetic Psychology, 135,* 93-102.

Locke, J.L. (2001). First communion: The emergence of vocal relationships. *Social Development, 10*, 294-308.

Lytton, H. (1990). Child and parent effects in boys' conduct disorder: A reinterpretation. *Developmental psychology, 26*(5), 683-697.

Maletesta, C.Z. (1986). Emotion socialization and expressive development in preterm and full-term infants. *Child Development, 57*, 316-330.

Markus, J., Mundy, P., Morales, M., Delgado, C.E.F., & Yale, M. (2000). Individual differences in infant skills as predictors of child-caregiver joint attention and language. *Social*

Development, 9, 302-315.

Matheny, A.P., Jr. (1989). Temperament and cognition: Relations between temperament and mental test scores (pp.263-282). In G.A. Kohnstamm, J.E. Bates, & M.K. Rothbart (Eds.), *Temperament in childhood.* Oxford, England: John Wiley & Sons.

McCabe, P.C., & Meller, P.J. (2004). The relationship between language and social competence: How language impairment affects social growth. *Psychology in the Schools, 41*, 313-321.

McEvoy, R., Rogers, S., & Pennington, B. (1993). Executive function and social communication deficits in young autistic children. *Journal of Child Psychology and Psychiatriy and Allied Disciplines, 34,* 563-578.

Meltzoff, A. (1988). Infant imitation and memory: 9-month-olds in immediate and deferred tests. *Child Development, 59*, 217-225.

Mervis, C.B., & Bertrand, J. (1994) Acquisition of the novel name-nameless category (N3C) principle. *Child Development, 65*, 1646-1663.

Milich, R., Landau, S., Kilby, G., & Whitten, P. (1982). Preschool peer perceptions of the behavior of hyperactivity and aggressive children. *Journal of Abnormal Child Psychology, 10*, 497-510.

Miller, S., & Scarr, S. (1989). Diagnosis of behavior problems in two-year olds. *Journal of Clinical Child Psychology, 18*, 290-298.

McGee, R., Feehan, M., & Williams, S. (1996). Mental health. In P.A. Silva & W.R. Stanton (Eds.), *From child to adult: The Dunedin Multidisciplinary Health and Development Study* (pp. 150-162). Auckland, New Zealand: Oxford University Press.

Morales, M., Mundy, P., Delgado, C.E.F., Yale, M., Messinger, D., Neal, R., & Schwartz, H.K. (2000). Responding to joint attention across the 6- through 24- month age period and

early language acquisition. *Journal of Applied Developmental Psychology 21*, 283-298.

Mundy, P. (2003). Annotation: The neural basis of social impairments in autism: the role of the dorsal medial-frontal cortex and anterior cingulated system. *Journal of Child Psychology and Psychiatry, 44*, 793-809.

Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., & Seibert, J. (2003). *A manual for the abridged Early Social Communication Scales (ESCS).* Unpublished manuscript.

Mundy, P., Fox, N., & Card, J. (2003). EEG coherence, joint attention and language development in the second year. *Developmental Science, 6*, 48-54.

Mundy, P., & Gomes, A. (1998). Individual differences in joint attention skill development in the second year. *Infant Behavior and Development, 21*, 469-482.

Mundy, P., Hogan, A., & Doehring, P. (1996). *A preliminary manual for the Abridged Early Social Communication Scales (ESCS).* Unpublished manuscript.

Mundy, P., Kasari, C., & Sigman, M. (1992). Nonverbal communication, affective sharing, and intersubjectivity. *Infant Behavior & Development, 15*, 377-381.

Mundy, P., Kasari, C., Sigman, M., & Ruskin, E. (1995). Nonverbal communication and early language acquisition in children with Down syndrome and in normally developing children. *Journal of Speech & Hearing Research, 38*, 157-167.

Mundy, P., & Sheinkopf, S.J. (1998). Early communication skill and developmental disorders. In J. Burack, R. Hodapp, & E. Zigler (Eds.), *Handbook of mental retardation and development* (pp. 183-207). Cambridge: Cambridge University Press.

Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders, 20,* 115-128.

Mundy, P., & Willoughby, J. (1996). Nonverbal communication, joint attention, and early socioemotional development. In M. Lewis & M. Sullivan (Eds.), *Emotional development in atypical children* (pp. 65-87). Hillsdale, NJ: Erlbaum.

Nigg, J.T., Goldsmith, H.H., & Sachek, J. (2004). *Journal of Clinical Child & Adolescent Psychology, 33*, 42-53.

Patterson, G., & Sanson, A. (1999). The association of behavioral adjustment to temperament, parenting and family characteristics among 5-year-old children. *Social Development, 8*, 294-309.

Pedlow, R., Sanson, A., Prior, M., & Oberklaid, F. (1993). Stability of maternally reported temperament from infancy to 8 years. *Developmental Psychology, 29*, 998-1007.

Prior, M., Smart, D., Sanson, D., & Oberklaid, F. (2000). Longitudinal predictors of behavioral adjustment in pre-adolescent children. *Australian & New Zealand Journal of Psychiatry, 35*, 297-307.

Prior, M., Smart, D.F, Sanson, A.V., & Oberklaid, F. (1993). Sex differences in psychological adjustment from infancy to eight years. *Journal of the American Academy of Child Adolescent Psychiatry, 32,* 291-304.

Putnam, S.P., Ellis, L.K., & Rothbart, M.K. (2001). The structure of temperament from infancy through adolescence. In A. Eliasz & A. Angleitner (Eds.), *Advances in research on temperament* (pp. 165-182). Germany: Pabst Science.

Putnam, S.P., Gartstein, M.A., Rothbart, M.K., & Jones, L. (In preparation). *Finegrained measurement of toddler temperament: The Early Childhood Behavior Questionnaire.*

Putman, S.P. Jones, L.B., & Rothbart, M.K. (April, 2002). *The Early Childhood Behavior Questionnaire: Development, psychometrics, factor structure, and relations with*

behavior problems. Poster presented at the Biennial Meetings of the International Conference on Infant Studies, Toronto, CA.

Putnam, S.P., Sanson, A.V., & Rothbart, M.K. (2002). Child temperament and parenting. In M.H. Bornstein (Ed.), *Handbook of parenting (2nd ed.): Volume 1: Children and parenting.* Muhwah, NJ: Erlbaum.

Raver, C.C., & Leadbeater, B.J. (1995). The problem of other in research on theory of mind and social development. *Human Development, 36*, 350-362.

Rothbart, M. K. (1989a). Temperament and development. In G. A. Kohnstamm, J. E. Bates, & M. K. Rothbart (Eds.), *Temperament in childhood* (187-247). Chichester, England: Wiley.

Rothbart, M. K. (1989b). Biological processes of temperament. In G. Kohnstamm, J. Bates, & M. K. Rothbart (Eds.), *Temperament in childhood* (77-110). Chichester, England: Wiley.

Rothbart, M.K., & Bates, J.E. (1998). Temperament. In W. Damon (Series Ed.) & N. Eisenberg (Eds.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th Ed.). New York: Wiley.

Rothbart, M.K., Chew, K.H., & Gartstein, M.A. (2001). Assessment of temperament in early development. In L.T. Singer & P.S. Zeskind (Eds.), *Biobehavioral assessment of the infant,* 190-208. New York: Guilford Press.

Rothbart, M.K., & Derryberry, D. (1981). Development of individual differences in temperament. In M.E. Lamb & A.L. Brown (Eds.), Advances in developmental psychology. Hillsdale, NJ: Erlbaum.

Rothbart, M.K., Derryberry, D., & Posner, M.I. (1995). A psychobiological approach to the development of temperament. In John E. Bates & Theodore D. Wachs (Eds*.),*

Temperament: Individual differences at the interface of biology and behavior (pp.83-116). Washington, DC: American Psychological Association.

Rothbart, M.K., Posner, M.I., & Hershey, K.L. (1995). Temperament, attention, and developmental psychopathology. In D. Cicchetti & D.J. Cohen (Eds.), *Developmental psychopathology: Volume 1: Theory and methods.* New York: Wiley.

Rubin, K.H., Burgess, K.B., & Hastings, P.D. (2002). Stability and social-behavioral consequences of toddlers' inhibited temperament and parenting behaviors. *Child Development, 73*, 483-495.

Sameroff, A.J., & Chandler, M..J. (1975). Reproductive risk and the continuum of caretaking causality. In F.D. Horowitz, M. Hetherington, S. Scarr-Salapatek, & G. Siegel (Eds.), *Review of child development research:* Vol 4 (pp. 187-244). Chicago: University of Chicago Press.

Sanson, A., Hemphill, S.A., & Smart, D. (2004). Connections between temperament and social development: A review. *Social Development, 13*, 142-170.

Sanson, A., Oberklaid, F., Pedlow, R., & Prior, M. (1991). Risk indicators: Assessment of infancy predictors of preschool behavioral maladjustment. *Journal of Child Psychology and Psychiatry, 32,* 609-626.

Sanson, A., & Prior, M. (1999). Temperament and behavioral precursors to oppositional defiant disorder and conduct disorder. In H.C. Quay & A.E. Hogan (Eds.) *Handbook of Disruptive Behavior Disorders* (pp. 397-417). New York: Kluwer Academic/Plenum Publishers.

Sanson, A., Smart, D., Prior, M., & Oberklaid, F. (1993). Precursors of hyperactivity and aggression. *Journal of the American Academy of Child & Adolescent Psychiatry, 32*,

1207-1216.

Scaife, M., & Bruner, J. (1975). The capacity for joint attention in the infant. *Nature, 253,* 265-66.

Schaffer, H.R. (1996). *Social Development*. Malden, MA: Blackwell.

Schaffer, R. (1984). *The child's entry into a social world.* New York: Academic Press.

Schmitz, S., Fulker, D.W., Emde, R.N., & Zahn-Waxler, C. (2001). Early predictors of problem behavior at age four. In R.N. Emde & J.K. Hewitt (Eds.), *Infancy to early childhood: Genetic and environmental influences on developmental change.* New York: Oxford

Schwartz, C.E., Snidman, N., & Kagan, J. (1996). Early childhood temperament as a determinant of externalizing behavior in adolescence. *Development and Psychopathology, 8*, 527-537.

Schwartz, C.E., Snidman, N., & Kagan, J. (1999). Adolescent social anxiety as an outcome of inhibited temperament in childhood. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*, 1008-1016.

Sheinkopf, S.J., Mundy, P., Claussen, A.H., & Willoughby, J. (2004). Infant joint attention skill and preschool behavioral outcomes in at-risk children. *Development & Psychopathology, 16*, 273-291.

Sigman, M., & Kasari, C. (1995). Joint attention across contexts in normal and autistic children. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origins and role in development.* Hillsdale, NJ: Erlbaum.

Sigman, M., Kasari, C., Kwon, J., & Yirmiya, N. (1992). Responses to the negative emotions of others by autistic, mentally retarded, and normal children. *Child Development, 63*, 796-807.

Sigman, M., & Ruskin, E. (1999). Continuity and change in the social competence of children

with autism, Down syndrome, and developmental delays. *Monographs of the Society for Research in Child Development, 64*(5, Serial No. 256).

Slabach, E.H., Morrow, J., & Wachs, T.D. (1991). Questionnaire measurement of infant and child temperament: Current status and future directions. In J. Strelau & A. Angleitner (Eds.), *Explorations in temperament: International perspectives on theory and measurement* (pp. 205-234). New York: Plenum.

Slomkowski, C.L., Nelson, K., Dunn, J., & Plomin, R. (1992). Temperament and language: Relations from toddlerhood to middle childhood. *Developmental Psychology, 28*, 1098-1095.

Smith, L., & Ulvund, S.E. (2003). The role of joint attention in later development among preterm children: Linkages between early and middle childhood. *Social Development, 12*, 222-234.

Snyder, L.S., Bates, E., & Bretherton, I. (1981). Content and context in early lexical development. *Journal of Child Language, 8*, 565-582.

Stevenson, J., Richman, N., & Graham, P. (1985). Behavior problems and language abilities at three years and behavioral deviance at eight years. *Journal of Child Psychology & Psychiatry, 26*, 215-230.

Strelau, J. (1983). *Temperament-personality-activity*. New York: Academic Press.

Tamis-LeMonda, C.S., & Bornstein, M.H. (1990). Language, play, and attention at one year. *Infant Behavior and Development, 13*, 85-98.

Thomas, A., & Chess, S. (1977). *Temperament and development*. New York: Brunner/Mazel.

Thomas, A., Chess, S., & Birch, H.G. (1968). *Temperament and behavior disorders in children.* New York: New York University Press.

Thomas, A., Chess, S., Birch, H.G., Hertzig, M.E., & Korn, S. (1963). *Behavioral individuality in early childhood.* New York: New York University Press.

Tomasello, T. (1995). Joint attention as social cognition. In C. Moore & P. Dunham (Eds.), *Joint attention: Its origins and role in development.* Hillsdale, NJ: Erlbaum.

Tomasello, M., & Farrar, M.J. (1986). Joint attention and early language. *Child Development, 57,* 1454-1463.

Tomasello, M., & Todd, J. (1983). Joint attention and lexical acquisition style. *First Language, 4,* 197-212.

Ulvund, S.E., & Smith, L. (1996). The predictive validity of nonverbal communicative skills in infants with perinatal hazards. *Infant Behavior and Development, 19,* 441-449.

Vallance, D.D., Cummings, R.L., & Humphries, T. (1998). Mediators of the risk for problem behavior in children with language learning disabilities. *Journal of Learning Disabilities, 31*, 160-171.

Vaughan, A., Mundy, P., Block, J., Burnette, C., Delgado, C., Gomez, Y., Meyer, J., Neal, A.R., & Pomares, Y. (2003). Child, caregiver, and temperament contributions to infant joint attention. *Infancy, 4*, 603-616.

Wachs, T.D., & Gandour, M.J. (1983). Temperament, environment, and six-month cognitive-intellectual development: A test of the organismic specificity hypothesis. *International Journal of Behavioral Development, 6*, 135-152.

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

Walker, S., Berthelsen, D., & Irving, K. (2001). Temperament and peer acceptance in early childhood: Sex and social status differences. *Child Study Journal, 31*, 177-192.

APPENDICES

Appendix A: ECBQ Scale Definitions

ECBQ Scale	Description
Activity Level	*Gross motor activity*
Attention	*Ability to focus attention*
Attentional Shifting	*Capacity to shift attention from one focus to another*
Affiliation	*Enjoyment of physical closeness with caregiver*
Discomfort	*Negative reactions to sensory environmental stimuli*
Fear	*Negative mood as a result of (or in anticipation of) perceived environmental threat, distress, etc*
Frustration	*Negative mood in response to goal blocking*
High-Intensity Pleasure	*Positive mood in response to high intensity, complexity and novelty experience*
Impulisivity	*Speed of reaction to environmental experience*
Inhibitory Control	*Ability to suppress unacceptable actions/responses*
Low-Intensity Pleasure	*Positive mood in response to low intensity, complexity and novelty experience*
Motor Activation	*Small motor activity, fidgeting*
Perceptual Sensitivity	*Reactivity to low-intensity sensory stimuli*
Positive Anticipation	*Pleasure in expectation of enjoyable activities*
Sadness	*Negative mood in response to suffering or disappointment*
Shyness	*Discomfort/inhibition in novel or uncertain social situations/interactions*
Sociability	*Pleasure in social situations/interactions with others*
Soothability	*Decrease in distress as a result of caretaker's soothing*

Appendix B: Correlations Between Joint Attention Measures

ESCS Behaviors	*Eye Contact*	Alt	Points	Points w/EC	Lower IJA	Higher IJA	Total IJA	C-IJA	RJA Follows
Eye Contact	*1*	***.413***	*-.118*	***.297***	***.906***	*-.038*	***.408***	***.596***	*-.208*
Alternates		*1*	*-.119*	*.202*	***.759***	*-.060*	***.329****	***.591***	*.045*
Points			*1*	***.373***	*-.151*	***.978***	***.801***	***.651***	*.242*
Points with Eye Contact				*1*	***.300****	***.559***	***.645***	*.159*	*.138*
Lower IJA (Eye Contact + Alternates)					*1*	*-.067*	***.444****	***-.702***	*-.118*
Higher IJA (Points + Points with Eye Contact)						*1*	***.864***	***.620***	*.247*
Total IJA							*1*	*.203*	*.186*
Composite - IJA (Ratio Higher IJA / Total IJA)								*1*	***.304****
RJA Follows									*1*

*Correlation is significant at the 0.05 level; **Correlation is significant at the 0.01 level.

Appendix C: Temperament Relationships with Language and Joint Attention

Language	*Joint Attention*
Executive Control	
Attention	
*Attention Shifting**	
*Inhibitory Control**	
Low Intensity Pleasure	*Affiliation*
Negative Affect	
Fear	
Frustration	
Discomfort	
+ *Perceptual Sensitivity*	-
Sadness	
High Intensity Pleasure	
+ *Positive Anticipation*	-

Note: * Related to joint attention alternates only. "+" Indicates a positive relationship with the dimension. "-" Indicates a negative relationship.

CURRICULUM VITA

Brenda J. Salley

Education:

2005 East Tennessee State University, Johnson City, TN
MA in Clinical Psychology

1999 East Tennessee State University, Johnson City, TN
BS, Magna cum Laude
Major: Psychology
Minors: Biology, Early Childhood Development

Professional Experience:

8/04 to 5/05 Practicum (Southwest Virginia Mental Health Institute, Marion, VA)

8/03 to 5/05 Graduate Research Assistant (East Tennessee State University)

8/03 to 5/05 Research Site Coordinator/Lab Director
(Program for the Study of Infancy, East Tennessee State University)

5/03 to 8/04 Applied Behavior Analysis Therapy

8/04 to 5/05 Instructor: Writing in Psychology (East Tennessee State University)

Professional Presentations:

Salley, B., Gemayel, R., Stephens, N. & Dixon, W. E., Jr. (2005). "Don't talk til you see the whites of their eyes!": Unhappy children engage in less joint attention. Poster accepted for presentation at the meeting of the Society for Research in Child Development, Atlanta.

Dixon, W. E. Jr., Salley, B., Harkleroad, E., Chumney, F., & Barner, S. (2005). Are children high in joint attention good at learning new words in the presence of distractions? Apparently so. Poster accepted for presentation at the meeting of the Society for Research in Child Development, Atlanta.

Dixon, W. E. Jr., Salley, B., Loudermilk, S. M., & Barner, S. (2003). "Shhh! We're tryin' to concentrate": Attention and environmental distraction in novel word learning. Poster presented at the meeting of the International Society on Infant Studies, Chicago.

Salley, B. & Ellis, J. (2002). Reasons for living, suicide ideation and personality type. Poster presented at the meeting of the Southeastern Psychological Association, New Orleans.