

ABSTRACT

Title of dissertation: CHARACTERISTICS OF EXUBERANCE:
NOVELTY-SEEKING, SOCIABILITY OR
EMOTION?

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Current theories of temperament posit that individual differences in activity, reactivity, emotionality, sociability and self-regulation arise from biologically based systems and that these differences remain relatively stable over the lifespan (Goldsmith et al., 1987). One temperamental profile, Exuberance, has emerged from both conceptual and empirical work. Exuberance has been variously conceptualized in the extant temperament literature and has been associated with both positive and negative socio-emotional outcomes in children. In order to ascertain the impact of Exuberance on later adaptation, the first major goal of the current study was to identify its core features. The second major goal of the study was to examine the relations between Exuberance and later adaptation.

Sixty toddlers and their caregivers participated in the study. At 24-months toddlers were invited to interact with a variety of novelty social and non-social stimuli and their caregivers were asked to complete the Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996). When the toddlers were 36-months old, caregivers were asked to complete the Child Behavior Checklist (CBCL/1.5-5; Achenbach & Rescorla, 2000) and the Infant-Toddler Social and Emotional Battery (ITSEA; Carter & Briggs-Gowan, 2003).

Separate confirmatory factor analyses were used to examine the factor structure of Exuberance and Sociability and to examine the relations between Exuberance and behavioral inhibition. Findings supported an orthogonal two-factor of Sociability (i.e. quality of attachment to caregiver and sociability with an unfamiliar adult) and an orthogonal two-factor model of Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult). The current study also lent support for the distinctiveness of Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult) from behavioral inhibition. Also, little convergence between the scale items from the TBAQ and behavioral observations of Exuberance was found. Emotion regulation was found to predict both positive and negative adaptation and to mediate the relations between novelty-seeking and later positive and negative adaptation. Also, novelty-seeking predicted later externalizing problems. Taken together, these findings indicate the need for examining the unique facets of Exuberance in order to understand the impact of this temperamental profile on later social and emotional development.

CHARACTERISTICS OF EXUBERANANCE:
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Dedication

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CHAPTER 1: INTRODUCTION

Temperament is most often conceptualized as reflecting individual differences in activity, reactivity, emotionality, sociability and self-regulation, which arise from biologically based systems, and that remain relatively stable over the lifespan (Buss & Plomin, 1984; Goldsmith et al., 1987; Kagan, 1998; Rothbart & Derryberry, 1981; Thomas & Chess, 1977). One temperamental profile that has emerged from both the conceptual and empirical work on temperament reflects individual differences in the tendency to show strong approach tendencies and intense positive emotion. In the sections below, I will refer to this temperamental profile as Exuberance.

Understanding the impact of Exuberance on socio-emotional development is of particular importance since it has been associated with both positive (Denham, McKinley, Couchoud, & Holt, 1990; Eisenberg, Wentzel, & Harris, 1998) and negative (Hirschfeld et al., 1992) outcomes in children. One potential reason that the impact of Exuberance on later social and emotional outcomes is poorly understood is due to the wide variety of characteristics attributed to this temperamental profile. For example, some models of Exuberance focus only on sociability (Buss & Plomin, 1984) while others include dimensions pertaining to motor activity and novelty-seeking behaviors (Fox, Henderson, Rubin, Schmidt & Calkins, 2001; Rothbart, Ahadi, Hershey & Fischer, 2001). Also, the role of sociability in Exuberance remains unclear, some models viewing it as a core dimension (Buss & Plomin, 1975; 1984) while others do not (Rothbart, Ahadi & Evans, 2000).

A second factor that potentially limits our understanding of the impact of Exuberance on later socio-emotional outcomes pertains to the measurement of this

temperamental profile. Specifically, many indices of Exuberance include items that are typically used to measure behavioral inhibition (i.e. fear and low approach to novelty). It is unclear however, how expressing low fear and low approach to novelty reflects Exuberance. In addition, most indices of Exuberance only include items that measure general approach behavior and positive emotion, even though there is evidence to suggest that the expression of approach and positive emotion may not be context or situation specific (e.g. Askan & Kochanska, 2004).

Given that there are several competing conceptual models of Exuberance emphasizing different facets, and that measures of Exuberance do not often include items assessing its unique behavioral concomitants, a major goal of the current study was to examine the factor structure of Exuberance when it was indexed with items assessing its unique behavioral concomitants. Thus, the first goal of the current study was to determine the centrality of the most predominant behavioral phenotypes (i.e. positive emotion, sociability and novelty-seeking) to Exuberance. For the reason that Sociability had been included in some models of Exuberance but not in others, a second goal of the current study was to examine the factor structure of Sociability in greater detail. Specifically, the relations between behaviors pertaining to the quality of attachment (i.e. approach and positive emotion expressed) to one's caregiver versus sociability (i.e. approach and positive emotion expressed with) with an unfamiliar adult were examined. The third goal of the current study involved looking at the relations between Exuberance and behavioral inhibition (i.e. high fear, high approach) in order to establish whether or not these constructs would be associated with one another when Exuberance was indexed via its own unique behavioral

concomitants (i.e. positive emotion, novelty-seeking, and sociability). The fourth goal of the current study involved examining the convergence of the caregiver report of toddler temperament via the Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996) and observed Exuberance. Confirmatory factor analysis was utilized to examine and compare these factor models.

Another major goal of the current study was to explicate the relations between Exuberance and later socio-emotional outcomes. Therefore, the fifth and final goal of the study involved looking at the relations between Exuberance with respect to later social and emotional outcomes; namely emotion regulation, social competence and externalizing behavior problems. Structural Equation Modeling was used to examine the proposed relations.

In the following sections I will first provide a review of several models of Exuberance including those put forward by Buss and Plomin (1975; 1984), Fox and his colleagues (Fox, Henderson & Marshall, 2001), Goldsmith and his colleagues (Goldsmith, 1996; Pfeiffer, Goldsmith, Davidson, & Rickman, 2002), and Rothbart (Rothbart & Bates, 1998). Chapter 2 will also discuss the similarities and differences between these three frameworks, as well review the relevant work from the adult personality and motivation literatures. Chapter 3 reviews current measures of Exuberance and identifies their limitations. Chapter 4 outlines the current study and Chapter 5 details the methods employed. Chapter 6 presents the results from the four separate confirmatory factor models along with details regarding the construct validity and reliability of each of the factors. Chapter 6 also presents the relations between Exuberance and later socio-emotional outcomes yielded by the modeling a

portion of the proposed model of Exuberance. Finally, Chapter 7 presents the conclusions and limitations of the current study, as well as the implications of this work for future research.

CHAPTER 2: WHAT IS EXUBERANCE?

Temperament conventionally refers to individual differences in activity, reactivity, emotionality, sociability and self-regulation, that remain relatively stable over the lifespan and that are posited to arise from biologically based systems (Buss & Plomin, 1984; Goldsmith et al., 1987; Kagan, 1998; Rothbart, 1981; Thomas & Chess, 1977). One temperamental profile that has emerged from the both conceptual and empirical work on temperament is Exuberance.

At least three theoretical models describing the antecedents and concomitant of this temperamental profile can be identified in the extant temperament literature. These include: (1) surgency, (2) exuberance, and (3) sociability. Although these models include some dimensions that are similar, they do include identical dimensions. Which of these dimensions are central features of Exuberance and which of these dimensions are not therefore remains uncertain.

In the following sections I outline the some historical perspectives on Exuberance. Next, the central features of the three most predominant models of Exuberance are compared and contrasted. Work from adult personality and motivation that may help elucidate the core features of Exuberance is also reviewed. Finally, the potential impact of Exuberance on later social and emotional development is examined.

2.1 Historical Perspectives

2.1.1 Competence Motivation

Robert White (1959) used the term competence to describe the inherent satisfaction in influencing one's environment or the "joy in being the cause". White

(1959) theorized that the urge towards competence is an innate drive that propels individuals to interact, manipulate and explore the environment. White's model of competence was in part a response to behaviorist perspectives on temperament. White argued that behaviorist perspectives of temperament were incomplete since they did not include the child's innate characteristics, such as activity and initiative, as potential factors that may also influence a child's tendency to behave in a particular manner.

White viewed competence as being undifferentiated in infants and young children, but that over the course of development, competence would become differentiated into more complex and specific motivational constructs (e.g. motivation to achieve).

Although White's (1959) model of competence included both internal and external factors that may act to impact the development of a child's temperament, specifically on individual differences in the tendency to explore or to seek novelty, his hypothesis has not been directly tested. This is largely due to the difficulty in quantifying and measuring concepts associated with the model such as "joy at being the cause" which are needed to empirically validate his model.

2.1.2 Playfulness

In the mid 1960s, Lieberman (1965) identified playfulness, or individual differences in the predisposition to bring a playful quality to interactions with one's environment, as a temperamental trait. Lieberman (1965) conceptualized playfulness as consisting of five components: (1) physical spontaneity or the quality of coordination or motor activity during play, (2) social spontaneity or the manner in

which a child interacts with others during play including behaviors such as cooperation, sharing and leading, (3) cognitive spontaneity or the imaginative quality of a child's play, (4) manifest joy or the extent to which a child expressed enthusiasm, exuberance, enjoyment and vocalized during play, and (5) sense of humor or the teasing and joking associated with a child's play as well as the generation of funny stories for others.

Many of the characteristics of playfulness outlined by Lieberman are included in contemporary models of Exuberance. Specifically, models of Exuberance put forward by Fox (Fox, Henderson, Rubin, et al., 2001), Goldsmith (Pfeiffer et al., 2002), and Rothbart (Garstein & Rothbart, 2003; Rothbart et al., 2001) include motor activity and manifest joy as central features. Interestingly, some contemporary models of Exuberance include elements of social spontaneity, such as the models put forward by Fox, Henderson, Rubin, et al. (2001), Pfeiffer et al. (2002), and Buss and Plomin (1984) while others do not, such as the model of Exuberance put forward by Rothbart (Garstein & Rothbart, 2003; Rothbart et al., 2001).

2.1.3 The Work of Thomas and Chess

Many of the current notions about temperament can be traced back to the pioneering work of two clinical psychologists Alexander Thomas and Stella Chess (1957, 1977) who conceptualized temperament as the stylistic components of behavior or the *how* of behavior and not the *what* or the *why* of behavior. Under their framework, temperament is differentiated from cognition, arousal, motivation or emotionality but seen as interacting with these factors. According to Thomas & Chess (1977) temperament bi-directionally affects a child's development by

influencing his/her immediate environment and by influencing his/her judgments, attitudes, and behaviors towards significant others in his/her environment.

Thomas and Chess developed categories of temperament based on frequent interviews with parents who detailed their infant's behavior. A behavior was considered to be a component of temperament if it met two major criteria: (1) the behavior was present in all the children, and (2) the behavior could have potential significance in influencing a child's psychological development. Using inductive content analysis, Thomas and his colleagues (Thomas, Chess, Birch, Hertzog, & Korn, 1963) established nine categories of temperament which included: rhythmicity of biological functions, activity level (the motor component present in a child's functioning), approach to or withdrawal from new stimuli (nature of the initial response to a new stimulus/approach positive & withdrawal negative), adaptability (ease with which they are modified in the desired direction), sensory threshold (intensity level of stimulation that is necessary to evoke a discernible response regardless of the specific form that the response may take or the sensory modality affected), pre-dominant quality of mood (the amount of pleasant, joyful, and friendly behavior as contrasted with unpleasant crying and unfriendly behavior), intensity of reaction (energy level of response regardless of its quality or direction), distractibility (the effectiveness of extraneous environmental stimuli in interfering with or altering the direction of the ongoing behavior), and persistence/attention span (attention span concerns the length of time the child pursues a particular activity).

Based on these nine dimensions Thomas and his colleagues (Thomas, Chess, & Birch, 1970) identified three temperamental clusters: easy, difficult, and slow-to-

warm up. The “easy child” was the predominant temperamental category in the sample studied, accounting for approximately 40% of the sample of 141 children. Children characterized as easy were likely to show regularity, positive approach responses to new stimuli, high adaptability to change and mildly or moderately intense mood that was preponderantly positive. In contrast, children characterized as “difficult” were likely to show irregularity, negative withdrawal responses to new stimuli, low adaptability to change and intense negative emotions and accounted for approximately 10% of the sample. The third type of temperament cluster, the “slow-to-warm up child”, typically exhibited low activity level, withdrawal to novel stimuli on their first exposure, slow adaptability to change, and a generally low intensity of reaction with a somewhat negative affect. The slow-to-warm child represented approximately 15% of the sample. Hence 65% of children could be described as belonging to one or another of the three categories which Thomas, Chess & Birch (1970) were able to define while the rest had mixtures of traits that did not add up to a general characterization.

Although not explicitly described as Exuberance, Thomas and his colleagues (Thomas et al., 1970) assessed dimensions related to this temperamental profile that included the assessment of affective and motor reactions to novel stimuli. The tendency to smile or vocalize to new stimuli can be seen as reflecting the positive emotion facet of Exuberance, and high approach behavior could be related to the strong appetitive behaviors also often associated with it. It is not clear however, whether or not Thomas and Chess viewed the tendency to approach novel stimuli as a qualitatively distinct phenomenon from the tendency to show withdrawal behaviors.

It therefore remains unclear whether Thomas and his colleagues would conceptualize Exuberance as a phenomenon with a unique set of antecedent conditions or whether they would view it as representing one end of a single continuum with behavioral inhibition and/or shyness.

2.2 Surgency

More recently, models of temperament have begun to explicitly identify and include dimensions pertaining to Exuberance. Mary Rothbart has put forward one such model. Rothbart views temperament as reflecting biologically based and relatively stable individual differences in reactivity and self-regulation (e.g. Rothbart & Derryberry, 1981; Rothbart & Bates, 1998). Under her model of temperament, reactivity is characterized as the excitability or arousability of behavioral, endocrine, autonomic, and central nervous system responses as assessed via the response parameters of threshold, latency, rise time and recovery time. Processes such as attention, approach, avoidance, and inhibition that serve to modulate reactivity characterize self-regulation. Individual differences in temperament can be observed in emotionality, activity and attention at all ages. Unlike the categorical models of temperament, Rothbart (Rothbart & Bates, 1998) views the behavioral dimensions of temperament as being on a continuum. Thus, individuals are hypothesized to vary in *all* dimensions of temperament to a greater or lesser extent.

Mary Rothbart and her colleagues (e.g. Rothbart & Derryberry, 1981; Rothbart et al., 2001) use the term surgency to describe the tendency to respond to novelty with approach behaviors and positive emotion. This constellation of behaviors is hypothesized to emerge out of individual differences in two types of

behavior patterns that present in infancy; positive emotionality and approach behavior. Frustration in response to a blocked goal or desired outcome is also a central feature of surgency.

2.2.1 Positive Emotion

Rothbart views the expression of positive emotion during social and non-social interactions as being equally related to the dimension of surgency. Although some researchers label the expression of positive emotion in a social context as sociability (e.g. Buss & Plomin, 1975; 1984), Rothbart (e.g. Rothbart & Bates, 1998) and others (e.g. Bradley, 1985) argue that this terminology is a misnomer since smiling and laughter also occur in response to novel objects. Thus, the expression of positive emotion in response to social and non-social objects is not differentially associated by either her Infant Behavior Questionnaire (IBQ; Garstein & Rothbart, 2003) or her Child Behavior Questionnaire (CBQ; Rothbart et al., 2001) assessments of temperament (see Table 1 for a list and description of infant scales and Table 2 for a list and description of child scales).

Several lines of evidence from Rothbart's own work do not support her notion about the ubiquity of the expression of positive emotion. First, the IBQ scale of affiliation, used to index the expression of positive emotion during social situations, did not load significantly with the surgency factor as was expected (Garstein & Rothbart, 2003). Instead, the affiliation scale loaded primarily on the orienting/emotion regulation factor. This suggests that the expression of positive emotion in a non-social context may not be associated with the expression of positive emotion in the context of social exchange. Also, data from a longitudinal study of

children from age 3-months to 7-years showed that laboratory measures of smiling and laughter to novel stimuli collected prior to 7-years were not correlated with CBQ scale of smiling and laughter at 7-years of age, but were significantly correlated with the CBQ scales of positive anticipation ($r_s = .38$ and $.40$ at 3 and 6.5 months respectively) and impulsivity ($r = .36$ at 3-months) at 7-years of age (Rothbart, Derryberry & Hershey, 2000). This finding also suggests that the expression of *across* social and non-social contexts not be significantly associated.

There is also work by Askan and Kochanska (2004) to suggest that the expression of positive emotion may not be related across contexts. In a study of 7-month old infants, confirmatory factor analysis of infants' joy reactions to a series of standardized episodes (3 episodes with a social-interactive component and 3-episodes with no social-interactive component) yielded a two-factor solution. Specifically, expressed joy in the social-interactive episodes did not load onto the factor associated with expressed joy during the non-social interactive episodes. Thus, the data from this study provides preliminary evidence for the need to specify the context in which positive emotion is indexed.

Therefore, in contrast to Rothbart's (Garstein & Rothbart, 2003; Rothbart et al., 2001) notion that the expression of positive emotion during social and non-social interactions is equally related to the dimension of surgency, there is preliminary evidence to suggest that the tendency to expression of positive emotion in social versus non-social contexts may *not* be related. The expression of positive emotion may therefore be more accurately conceptualized in terms of its expression in social versus non-social situations.

2.2.1 Approach Behavior

The second behavior pattern postulated by Rothbart to be a core feature of Exuberance is approach behavior, specifically the tendency to approach novelty. According to Rothbart, individual differences in reflexive appetitive responses can be discerned in the newborn infant but become more apparent between 6- to 9-months due to motoric maturation.

In order to examine the correlates of approach behavior, Rothbart examined the relations between infant's approach tendencies and maternal reports of child temperament at 7-years of age. Rothbart et al. (2000) reported that infant latency to approach and grasp small objects (measured at 6.5-, 10- and 13.5-months of age) was significantly correlated with maternal report of child approach of non-social stimuli at 7-years of age. Specifically, the latency to approach novel objects in infancy was related to the CBQ scales of impulsivity ($r_s = -.39, -.46, \text{ and } -.41$ at 6.5, 10, and 13.5-months respectively) and positive anticipation ($r_s = -.67, -.58, \text{ and } -.46$ at 6.5, 10, and 13.5-months respectively) at 7-years of age. The strong association between the tendency to display approach behavior in infancy and early childhood and later impulsivity and positive anticipation highlights the stability of this behavioral response. It also suggests that context, in this case a non-social stimulus, may be important to examine since it may impact whether approach behavior is elicited.

2.2.3 Anger and Frustration

Another facet of behavior that is central to Rothbart's conceptualization of surgency is the expression of frustration in response to a blocked goal (Ahadi & Rothbart, 1993). Rothbart has found a strong positive relation between infants' rate

of approach to objects in the laboratory and their later Impulsivity, lower Inhibitory Control, and higher Anger/Frustration, and Aggression as measured by the Child Behavior Questionnaire at 7-years of age (Rothbart et al., 2000). She therefore suggests that anger and frustration is a central feature of Exuberance.

Rothbart (Rothbart & Derryberry, 1981; Rothbart et al., 2001) speculates that the strong approach component of Exuberance may be associated with at least two different developmental outcomes. One possibility is that infants with strong approach tendencies may be more likely to engage in active exploration of their environment and to interact with a wider range of people, objects, and events. These infants will tend to experience these events as pleasurable and safe. Alternatively, the tendency to show strong approach tendencies may contribute to the development of externalizing behavior problems. Rothbart suggests that self-regulatory competencies may modulate the relations between Exuberance and positive and negative socio-emotional outcomes (Rothbart & Bates, 1998).

2.2.4 Summary

Rothbart has put forward one of the most influential models of Exuberance. Under her temperamental framework, the term surgency has been used to describe infants and young children that exhibit high approach behaviors, positive emotion, and frustration in response to a blocked goal. Rothbart's model of surgency does not differentiate between the expression of approach and positive emotion to social and non-social stimuli. Work by Rothbart indicates that the tendency to display approach behavior to novel objects during infancy is highly correlated with the tendency to display approach behavior to novel objects during childhood. Rothbart also suggests

that, depending on a child's self-regulation capacities, surgency may be related to either positive or negative outcomes

2.3 Exuberance

In contrast to Rothbart's model of temperament, which views dimensions of temperament as being continuous, several theorists (Buss & Plomin, 1984; Fox, Henderson, & Marshall, 2001; Goldsmith et al., 1987; Kagan, 1998; Thomas & Chess, 1977) have put forward categorical models of temperament. Categorical models of temperament, view temperament as reflecting early appearing individual differences that are moderately stable over time and situation, and which are under some genetic influence. To date, two categorical models of Exuberance have been put forward.

Fox and colleagues (Fox, Henderson & Marshall, 2001; Fox, Henderson, Rubin, et al., 2001) have put forward one categorical model of Exuberance. Under this model, Exuberance is characterized as the tendency to display high sociability, lack of fear and high approach in response to novelty. Elaborating on the work of Rothbart (Rothbart et al., 2000) and others (Fabes & Eisenberg, 1999) which have noted that effortful control skills are critical for the regulation of behavioral and physiological reactivity, Fox and colleagues (Fox, Henderson, & Marshall, 2001) suggest that the development of such skills is especially important for temperamentally Exuberant children since the absence of these skills during challenging circumstances may result in the expression of impulsivity, anger, and high activity.

Goldsmith and colleagues have also used the term Exuberance to characterize children who display intense positive emotionality, approach to highly stimulating activities and risk-taking behaviors (Pfeiffer et al., 2002). Goldsmith argues that because Exuberance has unique concomitants, such as positive emotionality, that it should be both conceptualized and operationalized as distinct from behavioral inhibition (i.e. high fear or withdrawal). The hypothesis that Exuberance does not represent one pole of an approach-withdrawal continuum has been affirmed in at least one study in which no correlation between Exuberance and inhibition to novelty was identified (Pfeiffer et al., 2002).

Existing longitudinal studies of Exuberance suggest that this temperamental pattern is a relatively stable characteristic (Fox, Henderson, Rubin, et al., 2001; Pfeiffer et al., 2002). For example, Fox, Henderson, Rubin, et al. (2001) found that approximately half of infants identified as Exuberant at 4-months maintained their behavioral profile during the next four years. Pfeiffer et al. (2002) also found that toddlers identified as Exuberant were more likely to maintain their exuberant classification at 7-years of age than children identified as inhibited. Given the value of the expression of positive emotion and Exuberance in Western cultures, Fox, Henderson, Rubin, et al. (2001) speculates that infants with this disposition are more likely to be reinforced and rewarded for the expression of these types of behaviors.

2.3.1 Positive Emotion

The tendency to express positive emotion is a central component of both the Fox and Goldsmith models of Exuberance. Unfortunately, both Fox and Goldsmith have derived their measures of Exuberance from Kagan's measures of behavioral

inhibition, which does not assess positive emotion (e.g. Fox et al., 2001; Pfeiffer et al., 2002). Specifically, these researchers have used *low* behavioral inhibition as a proxy measure for Exuberance. For example, in most of the work by Fox and his colleagues (e.g. Fox et al., 2001) the composite score of Exuberance was computed as the *inverse score* of: (1) the latency to vocalize; (2) approach and touch toys; (3) tendency to be in close proximity to peers; and (4) the amount of expressed negative affect. Also, in the study by Pfeiffer et al. (2002), the latency to approach toys, proximity to mom and vocalizations were included in the composite score of Exuberance.

Measuring the unique concomitants of Exuberance may be important since there is evidence to suggest that some of these factors may contribute to the stability of Exuberance. For example, drawing on the work which demonstrates that positive emotions are uniquely associated with patterns of hemispheric activation in the left frontal region (Fox, 1991; Davidson, 1994; 1995, Robinson & Downhill, 1995; Tomarken, Davidson, Wheeler, & Doss, 1992; Wheeler, Davidson, & Tomarken, 1993), Fox, Henderson, Rubin et al. (2001) have suggested that patterns of left frontal EEG asymmetry may be a physiological marker of Exuberance. In a study of 4-year old children, left frontal EEG asymmetry was associated with a greater frequency of social interaction and positive emotion (Calkins, Fox, & Marshall, 1996). Furthermore, the association between a pattern of left frontal EEG asymmetry and Exuberance appears to be a relatively stable phenomenon given that infants identified as exuberant at 4-months of age were more likely to display a pattern of left frontal EEG asymmetry at 9-months and 4-years of age.

2.3.2 Approach Behavior

Appetitive behavior is also a central feature of the Fox and Goldsmith models of Exuberance. Fox and Goldsmith do not index approach behaviors toward non-social versus social stimuli. For example, infants identified as displaying high motor activity and high positive affect towards novel toys at 4-months of age were observed to show greater approach to novel toys during a free-play, interaction with a stranger, and while playing with a tunnel (Calkins et al., 1996) 14-months of age.

2.3.3 Anger and Frustration

As noted above, the expression of frustration or anger in response to a blocked goal has been posited to be a key component of Exuberance in the models put forward by Fox and Goldsmith (Fox, Henderson, Rubin, et al., 2001; Pfeiffer et al., 2002). Like Rothbart, Fox and his colleagues (Fox, Henderson, Rubin, et al., 2001; Stifter & Fox, 1990) suggest that emotion regulation plays a critical role in the development of positive or negative outcomes for Exuberant children. Specifically, they have suggested that for Exuberant children, strong emotion regulation is associated with positive developmental outcomes and poor emotion regulation is associated with negative outcomes.

2.3.4 Summary

Fox (Fox, Henderson, Rubin et al., 2001) has conceptualized Exuberance as reflecting the tendency to display high sociability, lack of fear and high approach in response to novelty. Goldsmith and his colleagues (Pfeiffer et al., 2002) have also used the term Exuberance to characterize children who display intense positive

emotionality, approach to highly stimulating activities and risk-taking behaviors. Both models of Exuberance emphasize the importance of positive emotionality, sociability and approach as central features of Exuberance however; both models rely on indices of low behavioral inhibition to assess it. Like Rothbart, Fox, Henderson, Rubin et al. (2001) also suggest that emotion regulation influences the likelihood that an Exuberant child will be put on a trajectory towards positive or negative socio-emotional outcomes.

2.4 Sociability

The EAS model (Buss & Plomin, 1984) is another example of a recent model of temperament that includes dimensions pertaining to Exuberance. The EAS identifies three broad dimensions of temperament that include emotionality, activity, and sociability. Only dimensions of temperament hypothesized to be genetic in origin and to appear within the first year of life are included in this model. Although, the three temperamental traits outlined in the EAS are thought to vary under developmental effects and environmental forces, a good deal of stability is still expected in the expression of these traits given their strong genetic underpinning. As a result, the three traits are hypothesized to provide the foundation of adult personality, and may be observed in animals (other than humans).

The first trait, emotionality, is a proxy for distress reactivity. High emotionality reflects the tendency to express intense emotional reactions that often appear out of control (e.g. tantrums) while low emotionality reflects the tendency to express no response to either intense or low stimulation. The second trait, activity, is an index of an individual's tempo and vigor. High activity is usually manifested by a

fast rate and amplitude of speaking and moving, and long durations of energetic behavior while low activity is usually manifested by the slow rate of such behaviors. The third trait, sociability, indexes the degree to which individuals prefer being with others rather than being alone. High sociability is associated with a stronger preference for being with others while low sociability is associated with a preference for being alone.

2.4.1 Sociability

The trait most relevant to Exuberance in the EAS is sociability. According to the EAS model, sociability is genetically based and can be observed in infants, children, and adults and in animals other than humans. Under this model, sociability is defined as the preference for being with others rather than being alone. Buss and Plomin (1975; 1984) emphasize that sociability does not just reflect a stronger need for either soothing or arousal. Specifically, they argue that individual differences in sociability arise due to a preference in how ones' needs are satisfied, rather than on the strength of that particular need. For example, when a *non-social* child craves excitement this child is likely to be aroused by objects and events. On the other hand, when a *sociable* child craves excitement, this child will seek out others because he/she wants the give-and-take feedback that can only be derived via social situations. Typical indicators of sociability are the frequency of attempts to initiate social contact, the number of affiliations, the amount of time spent with others, reactions to isolation and social responsiveness.

Interestingly, Buss and Plomin do not distinguish attachment or affiliation (i.e. the tendency to enjoy close personal bonds with close family members) from the

general enjoyment of social situations. As will be discussed in more detail below, several theorists (Church & Burke, 1992; Depue & Collins, 1999; Hogan, 1983) studying adult personality suggest that Extraversion should be conceptualized as reflecting at least two unique interpersonal traits: affiliation, which reflects warmth, affection, and the enjoyment of close interpersonal relationships, and agency which reflects the experience of a sense of potency in accomplishing goals and attaining social dominance or leadership. The independence of affiliative and agentic traits have been demonstrated in human adult populations via the analysis of peer ratings after extensive social interaction experiences (Hurley, 1998) and in comparative studies of personality in nonhuman primates (Byrne & Suomi, 1998; Capitanio, 1999; Champoux, Higley, & Suomi, 1997). In order to be able to more accurately conceptualize Exuberance it may be necessary to delineate affiliation from agency, as appears to be the case with adult Extraversion.

2.4.2 Positive Emotion

Buss and Plomin (1975; 1984) do not include positive emotion as a core component of their model of sociability. They acknowledge that individuals who are highly sociable may express positive emotions more frequently. They argue however, that because positive emotionality is not clearly heritable, and because it is not associated with autonomic arousal, that it should not be included as a core component of the sociability. They speculate that if there is temperamental input into individual differences in positive emotions it is likely to be activity (for elation) or sociability (for friendliness and warmth). Interestingly, the model of adult Extraversion proposed by Eysenck and Eysenck (1985), and the model of adult novelty-seeking

proposed by Zuckerman (1969; 1991) do not include positive emotion as a core component.

2.4.3 Summary

Buss and Plomin (1975; 1984) emphasize that positive emotion is not a core component of sociability. They acknowledge that individuals who are highly sociable may express positive emotions more frequently, but they argue that because positive emotionality is not clearly heritable and, because it is not associated with autonomic arousal, it should not be included as a core component of the sociability dimension. They speculate that if there is temperamental input into individual differences in positive emotions it is likely to be for activity (for elation) and not for sociability (for friendliness and warmth). Also, facets of sociability such as agency and affiliation may need to be further delineated so that Exuberance can be more accurately conceptualized.

2.5 Relevant Models of Personality, Motivation, and Affiliation

Theoretical and empirical data from studies of adult personality may also yield insight into understanding the core components of Exuberance. Historically, there have been two approaches to examining adult personality. The first empirically based approach involves utilizing factor analysis of questionnaire data in order to derive broad independent personality traits. The second approach involves examining models in which theoretically based personality dimensions are linked to neurobiological systems. In the following sections I will review data from studies of adult personality and motivation that have potential relevance to the study of

Exuberance. Specifically I will review; (1) the Five-Factor model of adult personality; (2) models of novelty-seeking and optimal arousal, (3) the BIS/BAS model of motivation, (4) the Seeking-System, and (5) the Behavior Facilitation System.

2.5.1 Five-Factor Model Adult Personality

Positive Emotion

The most widely employed personality model, the Five-Factor Model (FFM; Costa & Widiger, 2001) identifies Neuroticism, Extraversion, Openness to Experience, Conscientiousness, and Agreeableness as the central dimensions of adult personality. Several studies have examined the relations between Extraversion, the factor bearing the strongest resemblance to Exuberance, and positive and negative affect. These studies raise important questions about how to best conceptualize this personality trait. For example, a number of studies have found a strong association between Extraversion and positive affect but no association with negative affect, and a strong association between Neuroticism and negative affect but no association with positive affect (Tellegen, 1985; Watson & Clark, 1992). The strong and clear relations between Extraversion and positive emotion, and between Neuroticism and negative affect, have led Tellegen (1985) to theorize that: (1) the Extraversion dimension should be relabeled Positive Emotionality, (2) the Neuroticism dimension should be relabeled Negative Emotionality, and (3) that the three other dimensions (i.e. Openness to Experience, Conscientiousness, and Agreeableness) should be dropped from models of adult personality. Therefore, according to Tellegen (1985), Extraversion should be conceptualized as Positive Emotionality, or the tendency to express positive emotion across contexts.

On the other hand, Watson and Clark (1992) have suggested that *all* of the personality traits are significantly related to negative or positive affect in some way, and thus should not be excluded from models of adult personality. To support their contention, Watson & Clark (1992) employed a principal components analysis to ascertain the associations between each of the five personality factors and the items associated with positive affect (i.e. joviality, self-assurance and attentiveness) and negative affect (i.e. fear, sadness, guilt, and hostility). For negative affect, they found that all four negative affect items were significantly associated with the Neuroticism dimensions. For positive affect the results were more complicated. Specifically, they found that Joviality and Self-Assurance items both loaded strongly and primarily on Extraversion. The Joviality item also had a modest secondary loading on Agreeableness. The Self-Assurance item was found to have a moderate loading on both Neuroticism and Agreeableness. Finally, Attentiveness loaded primarily on to Conscientiousness, but had a modest loading on Extraversion as well. Given that the three positive affect items loaded differently and onto all five personality dimensions, Watson and Clark (1992) argued that Extraversion could not just be reduced to Positive Emotionality but that it should be examined in response to different conditions or situations.

Taken together, these results suggest that the five personality factors are differently related to unique facets of positive emotion. Given that different aspects of positive emotion are related to the five personality traits in different degrees, it may be the case that the expression of positive emotion is context or stimulus specific. If the expression of positive affect is context or stimulus specific, this may

be one possible explanation for why certain facets of positive emotion are more strongly related to particular aspects of Extraversion.

Thus, the data on adult Extraversion suggests two plausible conceptualizations of Extraversion. First, Extraversion may be conceptualized as reflecting general positive emotionality (Tellegen, 1985). Second, different aspects of Extraversion have been found to be associated with different facets of positive emotionality, leading some theorists to suggest that both Extraversion and positive emotion be conceptualized as being comprised of several different constructs (Lucas, Diener, Grob, Suh, & Shao, 2000; Watson & Clark, 1997).

Mirroring the work on adult Extraversion and its relation to positive affect, clarifying the relations between Exuberance and positive emotion in the infant/child appears to be an important step towards creating a more accurate measure and a clearer conceptualization of this temperamental profile. As noted above, the one study that has examined the relation between the expression of positive emotion in social versus non-social contexts also supports the need to specify the context in which positive emotion was indexed (Askan & Kochanska, 2004). Determining whether Exuberance should be conceptualized as simply reflecting general positive emotionality or as reflecting two different tendencies, the tendency to express positive emotion in social contexts (i.e. sociability) or the tendency to express positive emotion in non-social contexts (i.e. novelty-seeking) therefore appears to be one of the next critical issues that need to be resolved in order to obtain a more accurate conceptualization of this temperamental profile.

Agency and Affiliation

A second aspect of Extraversion that may yield insight into understanding the core components of Exuberance is based on the work of several trait psychologists. Theorists (Church & Burke, 1992; Depue & Collins, 1999; Hogan, 1983) suggest that Extraversion should include at least two different interpersonal traits: affiliation, which reflects warmth, affection, and the enjoyment of close interpersonal relationships, and agency which reflects the experience of a sense of potency in accomplishing goals and attaining social dominance or leadership. The independence of affiliative and agentic traits have been demonstrated in human adult populations via the analysis of peer ratings after extensive social interaction experiences (Hurley, 1998) and in comparative studies of personality in nonhuman primates (Byrne & Suomi, 1998; Capitanio, 1999; Champoux et al, 1997).

The independence of affiliation and agency is also suggested by the different neurobiological systems hypothesized to sub-serve each of these traits. The neurohypophyseal peptides of oxytocin and vasopressin have been implicated as the central mediators of complex social behaviors, including affiliation, parental care and territorial aggression (Young, Wang, & Insel, 1998). Insel and Young (2001) suggest that at least two major neural circuits underlie the establishment of social bonds. First, projections from the amygdala and lateral septum to the rostral hypothalamus (medial preoptic area) appear vital to the formation of parental and pair bonds. Second, projections from the rostral hypothalamus to the ventral tegmental area may be essential for the integration of social information in reward pathways. More specifically, this second circuit is hypothesized to activate the mesolimbic dopamine reward circuit to mediate the rewarding properties of social interaction via pathways

linking the anterior hypothalamus and the ventral tegmental area and the nucleus accumbens shell.

On the other hand, *only* activation of regions such as the medial orbital frontal cortex, amygdala, and nucleus accumbens via dopamine (DA) have been implicated in the expression of agency. Based on the fact that affiliatory behavior is impacted by oxytocin and vasopressin whereas agentic behavior is not, Depue and his colleagues (Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005) have suggested that the behavioral phenotypes of affiliation and agency are not necessarily related, even though both of these approach motivated behaviors may rely on a central reward neuro-circuit that acts to propel all types of approach behavior.

Taken together, empirical and neurobiological work provides two lines of evidence suggesting that the interpersonal dimensions pertaining to Extraversion may be better represented as consisting of at least two unique constructs: affiliation and agency. As appears to be the case with Extraversion, it may also be necessary to delineate between affiliation and agency, or the approach to familiar and unfamiliar social partners, or approach to familiar and unfamiliar social partners, in order to be able to more accurately conceptualize Exuberance. As noted above, factor analysis of infant questionnaire data (Garstein & Rothbart, 2003) indicates that the IBQ scale of affiliation is not associated with the surgency factor but is associated with orienting/emotion regulation factor. This finding suggests that affiliation may not be related to Exuberance whereas the trait of agency may be. Determining which interpersonal domains, agency and/or affiliation, are central to Exuberance therefore

appears to be another critical issue that needs to be resolved in order to obtain a more accurate conceptualization of this temperamental profile.

Novelty-Seeking and Arousal

Several personality theorists including Eysenck (1967) and Zuckerman (1969, 1991) elaborated on early models of motivation and emotion (Duffy, 1962; Hebb, 1955) by applying the notion of “optimal level of stimulation” to adult personality. Within these models of adult personality, individual differences in personality traits were due to variation in the amount of stimulation needed to function at an optimal level. For example, Eysenck (1967) suggested that individual differences in Introversion and Extraversion could be attributed to an imbalance between excitatory and inhibitory mechanisms. Eysenck posited that variation in the ascending reticular activating system (ARAS), which he theorized was responsible for regulating the amount of information entering the cortex, differed in introverts and extraverts. Specifically, he theorized that ARAS allowed more information to enter the cortex of introverts than the ARAS of extraverts and that resultant low levels of sensory input reaching the cortex in extraverts would eventually cause chronic underarousal and lead to novelty or sensation-seeking.

Zuckerman (1969; 1991) also utilized the notion of optimal level of arousal in his model of adult personality by using it to describe individual differences in sensation-seeking. Within his personality framework, variations in sensation-seeking were thought to arise due to reduced activity in the dopaminergic system. Specifically, sensation-seekers were thought to have very low tonic activity in the

dopaminergic system, which motivated them to engage in “risky” behavior in order to increase the activity of the system.

The models of novelty- and sensation-seeking suggest that adult extraverts or sensation-seekers regulate their underarousal by seeking out “risky” stimuli. In terms of developing better conceptualizations and measures of Exuberance, one possible extension of the work on adult novelty-seeking may be to include it in indices of Exuberance. As will be discussed in greater detail in the next chapter, many indices of Exuberance (e.g. Fox, Henderson, Rubin, et al., 2001; Pfeiffer et al., 2002) do not index the unique behavioral concomitants of it. As a result, Exuberance has often been negatively associated with aspects of behavioral inhibition or negative affectivity (Rothbart et al., 2001).

In order to delineate Exuberance from other temperamental profiles, its unique concomitants should be assessed. Therefore, rather than using low behavioral inhibition or *only* high approach to measure Exuberance, behaviors which are hypothesized to be uniquely associated with Exuberance, such as the intensity of positive emotion expressed should also be indexed.

2.5.2 Motivational Models of Adult Personality

Gray’s BIS/BAS Model

Utilizing the principles of classical conditioning from the extant animal literature, Gray (1970; 1971; 1982; 1987) proposed a motivationally based model of adult personality. The central tenant of Gray’s model is that individual differences in approach and withdrawal motivation are due to variations in the sensitivity of different neural circuits to particular classes of stimuli. Gray hypothesized that

approach and withdrawal behaviors arise from the activation or inhibition of three types of neural circuits: (1) the flight-fight system, (2) the behavioral activation system (BAS) and, (3) the behavioral inhibition system (BIS).

Within Gray's framework, the BIS and BAS are viewed as mutually competitive systems. Specifically, the BAS facilitates responses to conditioned and unconditioned stimuli that signal reward and/or the termination of punishment. Thus, when the BAS predominates, approach behavior and positive affect result. The major neural systems associated with the BAS include two inter-related subsystems: (a) the caudate motor system that includes regions of the non-limbic cortex (motor, sensorimotor, and association cortices), the caudate-putnam, dorsal globus pallidus, the ventral lateral thalamus, and the substantia nigra; and (b) an accumbens motor system that contains prefrontal and cingulate cortex, nucleus accumbens, ventral globus pallidus, and dorsomedial thalamic nucleus. Activation of the BAS also results in the recruitment of reward-related ascending dopamine projections from the substantia nigra, amygdala, and nucleus accumbens.

In contrast to the BAS, the BIS is hypothesized to respond to signals of non-reward, unconditioned fear stimuli, and novelty. The BIS facilitate the expression of behavioral inhibition and therefore is associated with increases in physiological arousal, heightened attention and information processing and the emotion of fear. Gray (Gray & McNaughton, 2000) has recently revised his initial conceptualization of BIS (Gray, 1982) to draw attention to the fact that the BIS is only activated when an organism is required to move toward a source of danger in order to achieve a desired outcome. According to this new model, the BIS is only activated when there

is simultaneous activation of the BAS. The major neural systems associated with the BIS are regions associated with the septal-hippocampal formation, since it is linked to regions such as the thalamus, midbrain, and orbital prefrontal cortex, which are thought to provide a “bottom-up” mechanism for the inhibition of ongoing behavior.

Gray has linked the BAS circuit to individual differences in impulsivity. He has argued that individuals with a more reactive BAS are more likely to show conditioned approach than are individuals with a less reactive BAS. A number of researchers have elaborated on this model and suggest that individual differences in impulsivity are the result of a strongly activated BAS system and a weakly activated BIS system (Fowles, 1980; Newman, Kosson & Patterson, 1992). Differentiating between these two potential underpinnings of impulsive behavior has implications for the conceptualization of Exuberance since it is unclear whether variations in impulsivity are due to individual differences in the strength of the systems supporting behavioral approach or are due to individual differences in behavior inhibition.

The Seeking System

More recently, two motivational models have been put forward to conceptualize approach motivation. The Seeking-System, as described by Panksepp (1998), consists of neural pathways that support the anticipation of rewarding stimuli and act to facilitate strong approach motivation. Utilizing research on reward pathways in the central nervous system, which often included measures of an animal’s willingness to self-stimulate brain regions, Panksepp (1998) has identified areas within the orbital frontal cortex, basolateral amygdala, and the lateral hypothalamus as responsible for facilitating approach to rewarding stimuli. He

suggests that approach to rewarding stimuli occurs via the regulation of motor movement through: (1) dopaminergic projections to the nucleus accumbens and the pedunclopontine nucleus, and (2) interactions with the midbrain dopaminergic pathways that project from the substantia nigra and the ventral tegmental area. It is also of note that the pathways bear a strong resemblance to the pathways in the BAS described by Gray.

Panksepp (1998) further posits that the role of dopamine is particularly important in facilitating approach to rewards since stimulation of the medial forebrain bundle of the lateral hypothalamus in mammals, which contains major sets of dopaminergic pathways, has been found to promote exploration, forging and reward-seeking (Panksepp, 1998). In addition, stimulation of dopaminergic systems in humans produces feelings of energy and invigoration similar to the feelings produced by other drugs such as cocaine and amphetamines that also act on these systems (Panksepp, 1998).

Behavioral Facilitation System

A second motivational model that has been put forward to conceptualize approach motivation is the Behavioral Facilitation System (BFS; Depue & Collins, 1999). Just like Panksepp (1998) Seeking-System, the BFS is based on the notion that dopamine facilitates motor functions associated with approach to rewarding stimuli. Depue and Collins (1999) suggest that the BFS is comprised of two major circuits: (1) the nucleus accumbens-ventral palladium circuit which is thought to code the intensity of the rewarding stimuli via the release of dopamine when activated, and (2) the medial orbital cortex-amygdala-hippocampus circuit which is thought to

function to integrate the salience of the reward. Under the BFS model, individual differences in approach are hypothesized to emerge due to variations in dopaminergic projections to limbic and frontal sites which are responsible for encoding the salience intensity of reward and to variations in areas which act to promote contextual processing.

Unlike both the BAS and the Seeking-System, the BFS model specifies that aggression towards an obstacle will occur if this obstacle is blocking a reward-goal. Thus, individuals with a highly reactive BFS are likely to express more intense positive affect and to initiate approach towards a reward-stimulus more quickly, however, they will also be more likely to show frustration if approach to this goal is blocked. Activation of the dopaminergic system, which has been posited to facilitate approach towards rewarding stimuli, is also thought to increase the expression of aggressive behaviors since the administration of dopamine agonists such as amphetamines have been found to enhance irritable aggression aimed at removing a frustrating obstacle (Depue & Collins, 1999).

It is of note that same reward neuro-circuitry is hypothesized to underlie approach to novel social and novel non-social stimuli. Depue and Collins (1999) suggest, however, that individual differences in approach motivation arise from variations in the sensitivity of individuals to social versus non-social cues. Thus, even though approach to social and non-social cues rely on the same motivational system to propel an organism towards a desired goal, the tendency to approach social versus non-social stimuli may not necessarily be related.

Models of approach motivation have been utilized by Rothbart (e.g. Rothbart & Derryberry, 1981) Fox (Fox, Henderson, & Marshall, 2001), Goldsmith (Goldsmith & Campos, 1986; 1990) to conceptualize Exuberance. Like the motivational models on which they are based, each of these models of Exuberance include intense positive emotion and approach to rewarding stimuli as core features. In line with the BFS, models of Exuberance put forward by Rothbart (Rothbart et al., 2001) and Fox (Fox, Henderson, Rubin, et al., 2001) include anger as a central feature. It is unclear, however, if anger is in fact a central feature of Exuberance or if this emotion is due to poor inhibition, as is suggested by the model of impulsivity in which low BIS inhibition of the BAS results in impulsive behavior.

2.6 What is the Impact of Exuberance on Later Social and Emotional Development?

Studies examining the relation between Exuberance and socio-emotional outcomes for children vary depending on whether the researchers emphasize the positive emotionality components of Exuberance or whether they instead emphasize the rapid approach and delight in highly stimulating activities.

Researchers who have emphasized positive emotionality tend to observe fairly uniform positive outcomes. These researchers tend to focus on happy or cheerful moods and have generally found that the display of positive emotion is associated with more positive social and emotional development (Denham et al., 1990; Eisenberg et al., 1998; Schaffer, 1966). For example, Denham and colleagues found that teacher reports of children's dispositional positive emotionality were positively related to children's dispositional sympathy (Denham et al., 1990). Some

researchers have suggested that positive emotion may also act as a buffer, or increase resilience, since children displaying this characteristic are more likely to receive greater attention from adult caregivers. For example, highly active and outgoing children in institutions were less likely to show behavioral maladjustment than children that did not display this pattern of behavior (Schaffer, 1966).

On the other hand, when researchers have focused on the strong approach or anticipatory components of Exuberance, the data seems to indicate a significant correlation with externalizing difficulties (Cicchetti & Toth, 1991; Oldehinkel, Hartman, De Winter, Veenstra, & Ormel, 2004; Hirschfeld et al., 1992; Wertlieb, Wiegel, Springer, & Feldstein, 1987). For example, children who displayed strong approach tendencies in laboratory assessments of responding to novel, ambiguous, or strange events at 21-months, 4-years, 5-years, and 7.5-years of age were significantly more likely to be diagnosed with oppositional disorder at 8 years of age as compared to all other children in the sample (Hirschfeld et al., 1992).

A number of theorists have suggested that the relations between Exuberance and later positive *or* negative socio-emotional outcomes may be mediated by emotion regulation skills (Eisenberg, Fabes, Guthrie & Reiser, 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998). Despite the fact that links between (1) strong emotion regulation and positive socio-emotional outcomes (e.g. Eisenberg et al., 1993; Eisenberg et al., 1996; Kruger, Caspi, Moffitt, White, & Stouthamer-Loeber, 1996); (2) impulsivity and approach behavior and negative socio-emotional outcomes (Cicchetti & Toth, 1991; Oldehinkel et al., 2004; Hirschfeld et al., 1992; Wertlieb et al., 1987); and (3) positive emotion and positive socio-emotional

outcomes are relatively well established, little work has directly examined the interaction between emotion regulation and different facets of Exuberance, such as sociability and novelty-seeking, on later socio-emotional outcomes.

One study by Rubin, Coplan, Fox and Calkins (1995) has examined the relations between one facet of Exuberance, sociability, and later socio-emotional outcomes. Based on parent temperament ratings and observed free-play behaviors, preschool children (ages 46-62 months) were classified as either: (1) low social interaction and good emotion regulators; (2) low social interaction, poor emotion regulators; (3) high social interaction and good emotion regulators; (4) high social interaction, poor emotion regulators; or (5) average. Results indicated that the low social interaction children who were poor regulators displayed more wary and anxious behaviors during the free play and had more internalizing problems than the low social interaction children who were good regulators or the average group. The high social interaction children who were poor regulators had more externalizing problems than either the high social interaction children who were good regulators or the average group. The results of this study raises the possibility that whether or not highly Exuberant children are observed to be angry or frustrated may depend on the development of regulatory competencies.

Studies of adult Extraversion may provide some initial clues about the relation between the activation of intense approach motivation and the ability to inhibit these responses. In a series of well-designed studies, Newman and colleagues (Newman, 1987a; Nicols & Newman, 1986) demonstrated that individual differences in approach behavior were due to variability in the sensitivity to reward cues.

Specifically, Extraverted adults showed more response preservation and errors during tasks that required shifts in response sets, produced more errors after punished responses on a task that required subjects to inhibit a rewarded response, and responded more quickly after punishment as compared to introverts. Importantly, differences in responses did not emerge during tasks in which there was reward only or punishment only feedback, thus suggesting that although Extraverts may be slower to alter an established response set, in the absence of reward, extraverts are equally motivated to avoid punishment as introverts. However, when reward is entered into the paradigm, the same punishment is insufficient to alter the extraverts' tendency to respond to reward. In addition, a study by Derryberry and Reed (1994) demonstrated that under both voluntary and involuntary conditions Extraverts were slower to shift attention away from positive incentive targets (where points could be gained) suggesting that the motivational processes associated with approach behavior may influence selective attentional processes.

Taken together, the studies examining the link between Exuberance and socio-emotional outcomes suggest that well-regulated Exuberance is likely to support positive outcomes whereas poorly regulated Exuberance is likely to result in externalizing problems. Also ascertaining which facet(s) of Exuberance a child is elevated in may help to identify whether they are more likely to display positive or negative socio-emotional outcomes.

2.7 Summary

Three major frameworks dominate the developmental literature on Exuberance. Although these three models of Exuberance overlap on some

dimensions, they are not identical. Specifically, Exuberance models put forward by Fox, Henderson, Rubin, et al. (2001) and Pfeiffer et al. (2002) contain four major dimensions, novelty-seeking, positive affect, frustration in response to a blocked goal and, high sociability while the surgency model put forward by Rothbart (Garstein & Rothbart, 2003; Rothbart et al., 2001) includes the first three but does not include sociability as a dimension. In contrast to these two models, the sociability model put forward by Buss & Plomin (1975) includes only the sociability dimension and it deemphasizes the importance of positive affect.

A review of the work on adult personality and motivation also pointed towards four additional issues that can be utilized to clarify current conceptualizations of Exuberance. First, the relations between positive emotion and Exuberance need to be clarified. As noted above, it is unclear whether Exuberance should be conceptualized as: (1) just reflecting positive emotionality or (2) as being context specific (i.e. expression of positive emotion to social stimuli versus the expression of positive emotion to non-social stimuli).

Second, the work on affiliation and agency suggests that the relation between these two types of interpersonal traits and Exuberance needs to be examined since it appears that these two behaviors are not necessarily related in adults (e.g. Depue & Collins, 1999) and appear to be sub-served by unique neuro- circuitries (Depue & Collins, 1999; Panksepp, 1998).

Third, models of adult personality based on “optimal functioning” suggest that the dopaminergic system of Extraverts are under-aroused, thus causing them to seek out “risky” activities in order to activate this neural system. Given that many indices

of Exuberance (e.g. Fox, Henderson, Rubin, et al., 2001; Pfeiffer et al., 2002) do not index the unique behavioral concomitants of this temperamental profile, the indexing of novelty-seeking behavior may be an effective way of delineating Exuberance from other temperamental profiles.

Finally, the work on motivational models suggests that Exuberance can be viewed as arising from dopaminergic reward systems. The three motivational models reviewed above (i.e. BIS/BAS, the Seeking-System and the BFS) are very similar in that the behaviors associated with approach include intense positive emotion and the moving towards a rewarding stimulus. All of the models differ in terms of their emphasis on anger and impulsivity. More specifically, the BIS/BAS model emphasizes the mutual inhibition of the BIS and BAS on one another in regulating approach to rewarding stimuli whereas the BFS contains neural mechanisms that support aggression when a desired goal is blocked. The Seeking-System is not associated with anger or impulsivity. The work on motivation therefore raises the question of whether children who appear to be extremely high in approach also tend to exhibit problematic behavior due a strong approach system or due to a lack of inhibition.

Due to the fact that Exuberance has been linked to both positive and negative social and emotional outcomes in children, a more precise definition of this temperamental profile is needed. By more accurately conceptualizing Exuberance researchers can begin to elucidate those factors of Exuberance associated with positive socio-emotional outcome from those associated with negative socio-

emotional outcomes as well as begin to ascertain the role of emotion regulation in modulating this temperamental profile.

CHAPTER 3: THE MEASUREMENT OF EXUBERANT TEMPERAMENT

A large number of methodologies have been used to examine the Exuberance. This is likely to be due to the wide range of models put forward to understand this construct. In the following section I will review the methodologies used to assess: (1) surgency, (2) exuberance, and (3) sociability. Within each section I will review the relevant questionnaire and observational assessments employed to assess Exuberance during infancy and toddlerhood.

3.1 Surgency: Methodological Considerations

Based on her model of temperament, Rothbart has developed assessments of surgency from infancy in adulthood. Like other dimensions of temperament, surgency is indexed by examining individual differences in reactivity and regulation. As noted above, reactivity refers to arousability of affect, motor activity and related responses, assessed by thresholds of latency, intensity, time to peak intensity, and recovery time of the reaction. Self-regulation refers to processes such as attention, approach-withdrawal, behavioral inhibition, and self-soothing, serving to modulate reactivity. Rothbart's emphasis on the affective nature of surgency is reflected in the numerous items related to smiling and laughter, positive anticipation, pleasure in quiet activities, and joy to highly arousing stimuli which have only been minimally assessed by other researchers studying approach behavior in infants and children.

3.1.1 Measurement of Surgency: Infancy

One of the most widely used caregiver report measures of infant temperament, the Infant Behavior Questionnaire (IBQ; Rothbart, 1981), was first introduced in

1981 and has recently been revised (IBQ-R, Garstein & Rothbart, 2003). Both the IBQ and the IBQ-R consist of aggregated item scores rating the frequency of behaviors across a range of situations and eliciting conditions. In the original IBQ, two scales could be conceptually linked to surgency. The first was the Distress to Limitations Scale that was defined as individual differences in infants' reactions to frustrating conditions. The second was Smiling and Laughter, which was characterized as the quantity of smiling, and laughter from the infant in any situation. Both the Distress to Limitations and Smiling and Laughter factors were thought to reflect a strong motivational tendency to approach, however, these factors were thought to constitute activation of two separate neural circuitries (Rothbart & Bates, 1998; Rothbart, Derryberry, & Posner, 1994; Rothbart et al., 2000). The third dimension, Activity Level, defined as the child's gross motor activity, including movement of arms and legs, squirming and locomotor activity, was also hypothesized to relate to surgency in that infants displaying high approach tendencies would do so through increased motoric activity.

The IBQ has recently been revised to include additional items related to positive emotionality (IBQ-R; Garstein & Rothbart, 2003). In the IBQ-R, several additional scales related to positive emotionality and approach behaviors were extended downwards from the Child Behavior Questionnaire (CBQ, Rothbart et al., 2001). Principal axis factor analysis of the 14 scales comprising the IBQ-R (see Table 1 for list of scales and descriptions) collected from 360 infants between the ages of 3- to 12-months identified a three-factor structure of temperament. The three

broad dimensions were identified as Surgency/Extraversion, Negative Affectivity, and Orienting/Regulation.

Low correlations between the three factors was generally observed:

$r(360) = .16$ between the Surgency/Extraversion and Negative Emotionality factors, $r(360) = .25$ between the Surgency/Extraversion and Orienting/Regulation factors and, $r(360) = -.30$ between the Negative Emotionality and Orienting/Regulation factors.

The internal consistency of the three factors was also reported. Cronbach's alpha for Surgency/Extraversion was .92 with estimates for Negative Affectivity and Orienting/Regulation factors both equaling .91.

Convergent validity was also evaluated for a subset ($n = 26$) of families.

Correlations between primary and secondary caregivers for all of the scales (except soothability which was .06) were above .25, and largely ranged from .30 to .71.

The IBQ-R Surgency factor contained primary loadings for Activity Level, Smiling and Laughter, High Intensity Pleasure, Approach/Positive Anticipation, and Vocal Reactivity. Interestingly both the Affiliation scale and the Distress to Limitation scale did not load primarily onto the Surgency/Extraversion factor but rather loaded primarily on the factor of Emotion Regulation and the Negative Reactivity factors respectively.

The IBQ-R has been employed to study the structure of temperament cross-culturally. This work is of particular interest to researchers attempting to identify the core features of Exuberance since obtaining an identical factor structure across cultures would support the centrality of these traits. In one study, cross-cultural differences in temperament were evaluated for Russian and US samples of infants

(Garstein, Slobdskaya, & Kinsht, 2003). Significant differences between Russian and US infants were identified for six of the 14 temperament dimensions evaluated.

Parents of infants in the US reported higher levels of smiling/laughter, high and low intensity pleasure, perceptual sensitivity, and vocal reactivity. In contrast, parents of Russian infants' reported higher levels of distress to limitations. Exploratory factor analysis revealed that there were also differences in the structure of temperament between the two cultural groups. Specifically, the three-factor structure (i.e. surgency/extraversion, negative affectivity, and orienting/regulation) of temperament was only replicated in the US sample. In the Russian sample a two-factor solution, identified as Surgency/Extraversion and negative affectivity, best fit the data.

3.1.2 Measurement of Surgency: Childhood

Rothbart and her colleagues have also developed a caregiver assessment of temperament for use with children 3- to 7-years of age. The Child Behavior Questionnaire (CBQ; Rothbart et al., 2001) consists of 15 scales designed to index 15 primary temperament characteristics (see Table 2 for list of scales and their description). Data from three different samples, 6- and 7-year olds, 4- and 5- year olds, and 3-year olds, were examined to look at the factor structure of the CBQ scales.

For the 6- to 7-year old sample, exploratory factor analysis yielded three factors from the CBQ, Surgency/Extraversion, Negative Affectivity, and Effortful Control. Internal consistency estimates for the CBQ scale ratings of 6- to 7-year olds ranged from .67 to .92, with a mean of .75. Low correlations were generally observed amongst the factors: $r(339)=.11$ between the Surgency/Extraversion and Negative Emotionality factors, $r(339)=-.01$ between the Surgency/Extraversion and Effortful

Control factors and, $r(339)=-.04$ between the Negative Emotionality and Effortful Control factors.

For the 4- to 5-year old sample, exploratory factor analysis yielded three factors from the CBQ, Surgency/Extraversion, Negative Affectivity, and Effortful Control. Internal consistency estimates for the CBQ scale ratings of 4- to 5-year olds ranged from .64 to .92, with a mean of .73. Low correlations were generally observed amongst the factors: $r(515)=.11$ between the Surgency/Extraversion and Negative Emotionality factors, $r(515)=-.01$ between the Surgency/Extraversion and Effortful Control factors and, $r(515)=-.04$ between the Negative Emotionality and Effortful Control factors.

For the 3-year old sample, exploratory factor analysis yielded four factors, however, this solution failed to converge because the communality estimated exceeded 1 during iteration. As a result, a three-factor solution was forced. The three-factor solution of Surgency/Extraversion, Negative Affectivity, and Effortful Control for the 3-year sample was substantially similar to that obtained with the two older samples. The major differences between the 3-year sample and the two older samples were: (1) the much smaller loading (.34) of the Perceptual Sensitivity scale onto the Effortful Control factor in the 3-year old sample than in the 6- to 7-year old (.51) and 4- to 5-year (.42) samples; (2) the much smaller loading (.14) of the Shyness scale onto the Negative Affectivity Factor in the 3-year old sample than the in the 6- to 7-year old (.31) and 4- to 5-year (.29) samples; (3) the much smaller loading (.36) of the Fear scale onto the Negative Affectivity factor in the 3-year old sample than in the 6- to 7-year old (.53) and 4- to 5-year (.55) samples and; (4) the much smaller

loading (.14) of the Soothability scale onto the Effortful Control factor in the 3-year old sample than in the 6- to 7-year old (.28) and 4- to 5-year (.30) samples. The Internal consistency estimates for the CBQ scale ratings of 3-year olds ranged from .64 to .92, with a mean of .73. Low correlations were generally observed amongst the factors: $r(147) = .13$ between the Surgency/Extraversion and Negative Emotionality factors, $r(147) = .08$ between the Surgency/Extraversion and Effortful Control factors and, $r(147) = -.07$ between the Negative Emotionality and Effortful Control factors.

Convergent validity was also evaluated for a subset ($n = 49$) of the families. Correlations between mother and father reports for children at 5-years of age for all of the scales ranged from .28 to .79 with mean agreement across scales of .51.

The Surgency/Extraversion scale is the scale Rothbart uses to index the approach system. Across both early and middle childhood, the following scales load highly on Surgency/Extraversion: Activity Level, Impulsivity, High Intensity Pleasure, and Shyness (loads negatively). Scales that are inconsistently associated with Surgency/Extraversion are Positive Anticipation/Approach and Smiling and Laughter. Perceptual Sensitivity or the detection of slight or low intensity stimulation from the environment also loaded on the surgency factor in infancy, but loaded on a dimension of self-regulation during early and middle childhood.

Cross-cultural work using the CBQ has been conducted to examine the ubiquity of the three-dimension factor structure (Ahadi & Rothbart, 1993). Despite the fact that a three-factor model of temperament also emerged in samples from Japan and from the People's Republic of China (PRC), the factor structures were similar but not identical to those found for the USA sample. In the USA sample, high-intensity

pleasure, activity level and impulsivity loaded positively onto one factor. These same scales also loaded positively together for the PRC sample and Japanese samples.

Where the factor structure of surgency differed was along the dimension of positive anticipation/approach and anger/frustration which loaded strongly and positively with the other scales in the surgency factor for the PRC sample but only moderately and positively with the other scales in the surgency factor for the both the USA and Japanese samples. In all three samples, shyness loaded negatively on the surgency factor. Taken together, the cross-cultural studies employed by Rothbart support the position that an approach system is a fundamental feature of temperament but that it can be influenced by culture.

3.2 Exuberance: Methodological Considerations

Exuberance has been primarily indexed via the coding of behavioral responses of infants, toddlers and young children to the presentation of a series of unfamiliar events in the laboratory. Much of these procedures have been adapted from the work of Kagan and colleagues (Kagan, Reznick, & Gibbons, 1989) who utilized a series of paradigms in order to study behavioral inhibition and disinhibition during the course of development.

3.2.1 Measurement of Exuberance: Infancy

Questionnaire Assessments

The Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996) is a 111-item parent report questionnaire designed to assess temperament in children between the ages of 16- to 36-months of age. Item analysis, rather than factor

analysis was utilized to identify the major dimensions of temperament. Five dimensions were identified and included: activity level, the tendency to express pleasure, social fearfulness, anger proneness and interest/persistence.

Internal consistency of the five scales across two samples, a mixed age sample (18- to 24-months, n=102) and an 18-month sample (n=105) was high ranging from .78 to .89 in both samples. Convergent validity was also evaluated for a portion of the sample (n=141). Correlations between mother and father reports of temperament for toddlers in a mixed aged sample ranged from .29 to .54 with mean agreement across scales of .41.

The discriminative properties of the five TBAQ scales were emphasized by the relatively low intercorrelations of scales in both the mixed-age and 18-month samples. Specifically the intercorrelations of the TBAQ scales in the mixed aged sample (n=237) ranged from .37 to -.34. The intercorrelations of the TBAQ scales in the 18-month sample (n=144) ranged from -.23 to .28.

Behavioral Assessments

The assessment of behavioral reactivity to sensory stimuli, which was first utilized by Kagan and his colleagues (e.g. Kagan & Snidman, 1991) consisted primarily of presenting infants with audio and visual stimuli that increased in complexity. The visual stimuli consisted of a series of three colorful mobiles that differed in the number of elements (i.e., 1, 3 and 7). The auditory stimuli consisted of a woman's voice speaking three different syllables (ma, pa and ga) that became increasingly louder over the course of stimulus presentation and a series of sentences being spoken simultaneously by an increasing number of individuals. Negative

affect, positive emotion, vocalizations and motoric reactivity to the stimuli were coded. Kagan speculated that low motoric and affective responses would be predictive of an uninhibited profile and that negative affectivity and high motoric reactivity would be predictive of an inhibited profile.

Fox and his colleagues (Fox, Henderson, Rubin, et al., 2001) utilized this sensory sensitivity paradigm to identify infants likely to exhibit Exuberance. Specifically, Fox, Henderson, Rubin, et al. (2001) hypothesized that infants who demonstrated a high positive emotion and high motoric activity to the sensory stimuli would be identified as exuberant later in development. Data from Fox, Henderson, Rubin, et al. (2001) study supported this hypothesis since infants who displayed high motoric activity and positive responses to the sensory stimuli at 4-months were more likely to show high sociability at 4-years of age.

3.2.2 Measurement of Exuberance: Childhood

Kagan and his colleagues also developed a risk room paradigm, which was designed to elicit strong approach behaviors from uninhibited children, and strong fearful and freezing behaviors from inhibited children (Kagan, Snidman, & Arcus, 1995). During the risk room episodes toddlers or young children and their mothers are escorted into a room which contained a variety of novel toys including items such as a large black box with a hole in it, a ladder mounted on the wall on which they could climb, a set of fragile chimes, and a stool which could be used to jump onto a mattress placed on the floor directly in front of the stool. Children are then encouraged to play with the toys in the room. During the 5-minute free-play three types of behaviors were coded including: the latency to touch the first toy, the latency to the

first vocalization and the total time in proximity to mom. The scores from these three scales are then added together to form a mean composite score of behavioral inhibition. Children with the highest latency scores are categorized as inhibited and children with lowest latency scores are categorized as uninhibited. A score for behavioral disinhibition was therefore equivalent to showing low levels of behavioral inhibition.

Goldsmith and his colleagues (Goldsmith & Rothbart, 1988) have recently attempted to describe more fully and to provide standardized coding schemes for “risk room” tasks. The Laboratory Assessment Battery (Lab-TAB; Goldsmith and Rothbart, 1996a; 1996b) consists of a series of standardized episodes aimed at eliciting particular discrete emotions, such as joy, anger and fear, from infants, toddlers, and young children. Of particular relevance to researchers interested in Exuberance are those episodes designed to elicit anger and joy. For each episode, latency, mean intensity and, peak intensity of discrete emotions, as well as activity level and vocalizations during the presentation of the target stimulus are coded. There are currently two versions of the Lab-TAB, a pre-locomotor version for younger infants (Lab-TAB; Goldsmith and Rothbart, 1996a) and, a locomotor version for older infants and toddlers (Lab-TAB; Goldsmith and Rothbart, 1996b).

3.3 Sociability: Methodological Considerations

3.3.1 Measures of Sociability: Infancy

Questionnaire Measures

The Infant Behavior Record (IBR; Bayley, 1969) is one part of the Bayley Scales of Infant Development. The IBR consists of 30-items which are designed to

rate the qualitative aspects of the infant's behavior such as social behavior, activity, attention and task-oriented behaviors (e.g. motor skills, specific sensory interest, and mouthing) during infant mental testing. Examiners use either a 5-point or 9-point scale at the end of the infant mental testing session to rate the infant's behavior during testing. Matheny (1980) identified three primary features of infant behaviors observed during testing which were eventually labeled as task orientation, test affect-Extraversion and activity.

Of particular interest to researchers studying social behavior in infants is the test affect-extraversion scale (see Table 3 for a full description of the items). Although it is not assessed in great detail, one high-quality feature of the IBR test affect-extraversion scale is the notion of assessing orientation to a variety of social others. Although examiners are only required to answer one question about the infant's response to a variety of social partners, the IBR does assess the infant's affective and behavioral responses to the mother, examiner and to other persons in general.

Behavioral Measures

There are currently no standardized assessments of sociability in infants. Rubin, Bukowski and Parker (1998) have identified several important social behaviors emerging during the first three years of life that can be used to index sociability. These behaviors include: (1) smiling, (2) imitation, (3) social referencing, and (4) joint attention.

Rubin et al. (1998) identify the intentional direction of smiles towards a social partner as an important part of an infant's social repertoire, and most caregivers

regard it as a major milestone in the relationship with their infant (Schaffer, 1971). During the first two to three months of life, the smiling response is reflexive, often occurring in the absence of readily identifiable visual stimuli (Darwin, 1872; Gewirtz, 1966). It is not until the third to fifth months that social smiling occurs in response to stimuli that have characteristics *similar* to the human face but are not necessarily people (e.g. Spitz & Wolf, 1946) and not the second half of the first year that the smiling response is selectively directed at particular individuals. Parenting style appears to influence the speed at which infants begin to show social smiling. For example, infants in an intact family environment tended to show a greater mean frequency of smiling as compared to residential institution or day nursery infants over an 18-month period (Gewirtz, 1966).

Rubin et al. (1998) identify imitation as an important component of an infant's social repertoire. In addition to encouraging the acquisition of motor skill and expression, imitation has been identified as a behavior employed by both newborns (Kugiumutzakis, 1998, 1999) and infants (Uzgoris, 1981) to engage others, and to maintain social bonds. Data indicates that neonates have an inborn capacity to imitate (Fogel, 1993; Meltzoff & Moore, 1994; Trevarthen, Kokkinaki, & Fiamenghi, 1999). For example, very young infants match the emotions of others by imitating facial expressions (Field, Woodson, Greenberg & Cohen, 1982), crying when peers cry (Hay, Nash, Pedersen, 1981; Martin & Clark, 1982), and depressing their own responding when their mothers act depressed (Cohn & Tronick, 1983).

Trevarthen et al. (1999) argue that imitation plays a role in the early dialogue between the infant and his or her caregiver because imitation occurs at a very

particular moment in the stream of interaction. Specifically, imitation occurs when these behaviors can act as affirmations, acceptances, or commentaries with respect to accentuated displays of the other person. Imitation is also viewed as a way for infants to identify an individual as an object of heightened admiration or social interest, and is used by older infants and toddlers to display and reinforce friendship or affiliation (Meltzoff & Moore, 1994; Trevarthen & Aiken, 2001).

Rubin et al. (1998) also identify social referencing as an important behavior utilized by older infants and toddlers to interact with others. Social referencing involves the use of information or appraisal of events from others to regulate behavior, and due to its cognitive requirements is thought to emerge late in the first year (Boccia & Campos, 1989; Feinman & Lewis, 1983; Klinnert, 1984; Klinnert, Emde, Butterfield, & Campos, 1986). Hornik and Gunnar (1988) suggest that social referencing allows infant's to use the emotional expressions of others to help them appraisal an event (i.e. affective social referencing) and/or to use others' instrumental actions of others to determine how to act toward novel objects or people (instrumental social referencing;). Due to its cognitive requirements social referencing is hypothesized to emerge late in the first year. Considerable debate still remains regarding the underlying processes associated with social referencing since it is not clear whether infants are truly appraising a situation from the point of view of another's feelings or whether they are simply imitating the emotions of others as younger infants do.

Joint attention or the ability of infants and young children to share attention with a social partner concerning an object and/or an event in one's environment, was

also identified by Rubin et al. (1998) as an important aspect of infant and toddler sociability. Joint attention is thought to facilitate the development of the intersubjective experience of affect or the understanding that the self and others can have homologous objectives, perceptions or feelings about objects or events (Bakeman & Adamson, 1984; Bruner, 1975; Tomasello & Haberl, 2003). Researchers have begun to focus on how social partners may affect the way infants marshal attention. Of particular interest is the emergence of triadic exchange, which involves infants coordinating their attention toward both a social partner and an object or event of common interest. For example, caregiver scaffolding may affect how cue properties become integrated into the infant's developing non-verbal communication system (Bruner, 1973).

Although social exchange during infancy and toddlerhood is most often examined within the context of the mother infant dyad, there is evidence to suggest that older infants and toddlers participate in social exchange with age-mates. Ross and Lollis (1987) suggest that social exchange amongst older infants and toddlers often occurs in the context of games. In addition to playing a role in linguistic communicative development (Bruner, 1975; 1983), infant and toddler games are also hypothesized to facilitate nonlinguistic communication because they require participants to "signal" to the partner to join the game or to take a turn (Goldman & Ross, 1978; Ross & Kay, 1980). The earliest stages of infant games often have simple rules such as turn-taking, role repetition on the completion of each round of playing (e.g. hiding and finding, building and toppling), and can have unique rules, requiring infants to adjust their behavior in response to the partner. For example,

infants and toddlers may be required to wait after their own turn, glance from the partner to an object involved in the game, show, offer or give a game toy to their partner, or vocalize in order to get the partners attention. During toddlerhood behaviors such as the ability to coordinate behavior with a play partner, the imitation of a peer's activity and an awareness of being imitated, turn taking that involves waiting and then responding to a peer during interchanges, the demonstration of helping and sharing, and the ability to respond to the peer partner's characteristics become important additions to a toddler's social repertoire.

3.3.2 Measures of Sociability: Childhood

Questionnaire Measures

The Colorado Child Temperament Inventory (CCTI; Rowe & Plomin, 1977) is a 30-item questionnaire instrument for caregivers to use in rating the behavior of children between the ages of 1 to 7-years of age. The CCTI is a merger of the empirically based dimensions of the New York Longitudinal Study and the model of the EASI temperament put forth by Buss and Plomin (1975; 1984). The CCTI is designed to assess six dimensions of temperament including the dimension of sociability (see Table 4 for list of the Sociability items).

Behavioral Measures

As in infancy, there are currently no standardized assessments of sociability in early childhood. A meta-analysis of children's peer relations in a sample of 5-12 year olds identifies seven broad behaviors commonly used to index sociability in early and middle childhood. These include: (1) social interaction (play activity and participation in activities); (2) communication skills (verbal communications that

included social conversation, asking questions, and instruction others); (3) problem solving (capacity to resolve a conflict, persuade or convince a peer, or provide or implements solutions to peer problems); (4) positive social actions (explicit behaviors that included helpful or supportive actions reflecting affection, concern, or empathy for others; cooperation; leadership); (5) positive social traits (traits that reflected characteristics that were conducive to social relations, including being liked, attractive, humorous, athletic, popular and having friends); (6) friendship relations (the specific indication of having friends) and; (7) social interactions with adults (Newcomb, Bukowski & Pattee, 1993).

3.4 Limitations of Current Assessments of Exuberance

Although a number of questionnaire and behavioral measures can be used to index Exuberance in infants and toddlers, these indices are limited in at least two major ways.

First, although there is evidence for the conceptual independence of behavioral inhibition or shyness and sociability in adults (e.g. Cheek & Buss, 1981; Schmidt, 1999) and in early childhood (Asendorpf & Meir, 1993) both behavioral and questionnaire indices do not measure the unique concomitants of this temperamental profile. Exuberance is often measured as low shyness or low behavioral inhibition. For example, most behavioral measures of Exuberance do not include behaviors such as positive emotionality, proximity to a social partner, or the number of social bids made to a social partner whereas indices of low behavioral inhibition including low latencies to touch an object, to vocalize, and a short duration of proximity to mom are

used to index Exuberance (e.g. Fox, Henderson, Rubin, et al., 2001; Pfeiffer et al., 2002).

Questionnaire measures also include items pertaining to low inhibition or shyness on scales of Exuberance. For example, inspection of the CBQ sub-factor of sociability/shyness reveals that it does not assess positive emotion during social situations or sociable behavior but only indexes behaviors such as the vigor of their child's approach to others and the frequency of their social interactions. Placing shyness and sociability along a single continuum may be one reason why factor analysis of the CBQ questionnaire data yields a shyness scale which loads positively onto the negative affectivity factor and also loads *negatively* onto the surgency factor (Rothbart et al., 2001).

There is also evidence for the physiological distinctiveness of behaviors pertaining to Exuberance from those of behavioral inhibition. Kagan has theorized that individual differences in infants' response to novelty are due to variations in the excitability of the central nucleus of the amygdala. Kagan further speculates that individual differences in reactivity to sensory stimuli differentiates behaviorally inhibited infants from all other infants since the central nucleus of the amygdala is activated by sensory input. Kagan therefore hypothesizes that infant's who display behavioral inhibition in toddlerhood and childhood will show more negative reactivity (i.e. more negative affect and high motoric activity) to sensory input than all other infants. In particular, Kagan posits that behaviorally inhibited toddlers will show freezing behavior, negative vocalizations and increases in autonomic function in response to novelty since this pattern of behavioral and physiological reactivity has

been reported in the animal literature as behavioral outputs of the fear system, and the amygdala in particular (see LeDoux, 1996 for extensive review). As discussed in Chapter 2, Exuberance has been associated with the neuro-circuitries of reward and not fear. The physiological distinctiveness of the neuro-circuitries hypothesized to give rise to Exuberance from those of hypothesized to give rise to behavioral inhibition further points to the distinctiveness of these constructs.

Therefore, in light of both empirical and neuro-biological work, it appears that behavioral inhibition and Exuberance would be more accurately measured using the unique behavioral concomitants of each rather than just by indexing Exuberance as *low* behavioral inhibition.

A second limitation of current measures of Exuberance is their lack of differentiation between the expression of positive affect in social versus non-social contexts. As noted above, there is evidence to suggest that the expression of positive affect towards social and non-social stimuli is not related (Askan & Kochanska, 2004). This finding is paralleled in the behavioral inhibition literature in which decreases in the associations between social and non-social fear occur from infancy through the preschool years (Fox, Henderson, Rubin, et al., 2001; Garstein & Rothbart, 2003; Goldsmith, 1996; Sanson, Pedlow, Cann, Prior, & Oberklaid, 1996; Rothbart et al., 2001; Scarpa, Raine, Venables, & Mednick, 1995).

Indexing social versus non-social may be particularly important since Exuberance has been linked with positive (Denham et al., 1990; Eisenberg, 1998) and negative outcomes (Hirschfeld et al., 1992). It is possible that some facets of Exuberance (i.e. novelty-seeking) may be more strongly related to negative social and

emotional development while other aspects of Exuberance (i.e. sociability) may be more strongly associated with positive social and emotional development. Without measures to distinguish between social and non-social approach, the relations between different facets of Exuberance to later social and emotional adaptation can not be explicated.

3.5 Summary

A large number of methodologies have been used to examine Exuberance; likely due to the wide range of models put forward to conceptualize this temperamental profile. Most questionnaire and behavioral assessments of Exuberance can be viewed as measuring one of the three major models of Exuberance including: (1) surgency, (2) exuberance, and (3) sociability. Current measures of Exuberance are limited since they do not measure the unique behavioral concomitants of it thus making it hard to distinguish this temperamental profile from behavioral inhibition or shyness. Also, the lack of distinction between social and non-social approach in current measures of Exuberance may impede the explication of the facets of Exuberance that may be associated with positive adaptation from those that may be associated with negative adaptation.

CHAPTER 4: THE CURRENT STUDY

This chapter outlines and describes the current study. It begins with a summary of the main issues pertaining to the conceptualization and measurement of Exuberance. Next, the purpose of the current study is presented. The chapter also advances a proposed model of Exuberance and its relations to positive and negative socio-emotional outcomes. Next, the portion of the proposed model that was assessed in the current study is outlined. The chapter concludes with the research goals of the current study.

4.1 Statement of Problem

Exuberance has been conceptualized in a number of different ways. As a result, current notions about the potential impact of this behavioral phenotype on social and emotional development remain vague and imprecise. While some advances have been made towards identifying the central features of Exuberance, the large number and wide variety of traits still associated with this phenotype suggest that more work is needed to differentiate core components of the construct from aspects of behavior that may reflect interactions of Exuberance with situational and/or other temperamental or dispositional factors. Considerable work is also needed to conceptually and empirically differentiate Exuberance from low behavioral inhibition. In addition, work is needed to discern the facets of positive emotion that may be close to the core of Exuberance from those that may be more closely associated with affiliation and sociability. Finally, work is needed to determine the factors that relate Exuberance to positive and/or negative social and emotional outcomes. This latter point overlaps with the need to carefully examine relations

between Exuberance and developmental outcomes, since Exuberance appears to be associated with higher social and emotional well-being in individuals with higher regulation and associated with externalizing problems in individuals with poor regulation.

4.2 Purpose of the Current Study

Given that Exuberance has been variously conceptualized in the extant literature, a major objective of the current study was to determine the core characteristics of this temperamental profile. Thus, the first goal of the current study was to examine the relations between two hypothesized domains of Sociability: affiliation or attachment (i.e. social behavior expressed during interactions with the primary caregiver) and agency or sociability (i.e. social behavior expressed during interactions with an unfamiliar adult). The second goal of the current study was to examine the factor structure of Exuberance (i.e. sociability and novelty-seeking) via confirmatory factor analysis. The third goal of the current study was to look at the relation between Exuberance (i.e. sociability and novelty-seeking) when indexed using unique concomitants (e.g. positive emotion, motor activity), and behavioral inhibition. The fourth goal of the study was to examine the convergence of caregiver report and behavioral assessments of Exuberance. Finally, structural equation modeling was employed to examine the nature of the relations between Exuberance and later socio-emotional outcomes.

4.3 Overview of the Proposed Model

Figure 1 depicts a proposed model of temperament. This model contains ten major components including the neuro-anatomical regions and neuro-chemicals associated with social bonding, reward and fear, as well as the hypothesized behavioral outputs of these three regions including attachment, sociability, novelty-seeking and, behavioral inhibition. In addition, emotion regulation is hypothesized to mediate the relations between positive outcomes or maladjustment. In the proposed model Exuberance is represented by the factors of sociability and novelty-seeking. The identification of these factors as key features of Exuberance, their relation to one another and to other temperamental traits is the result of reviewing the contemporary literatures on temperament, adult personality and motivation literatures.

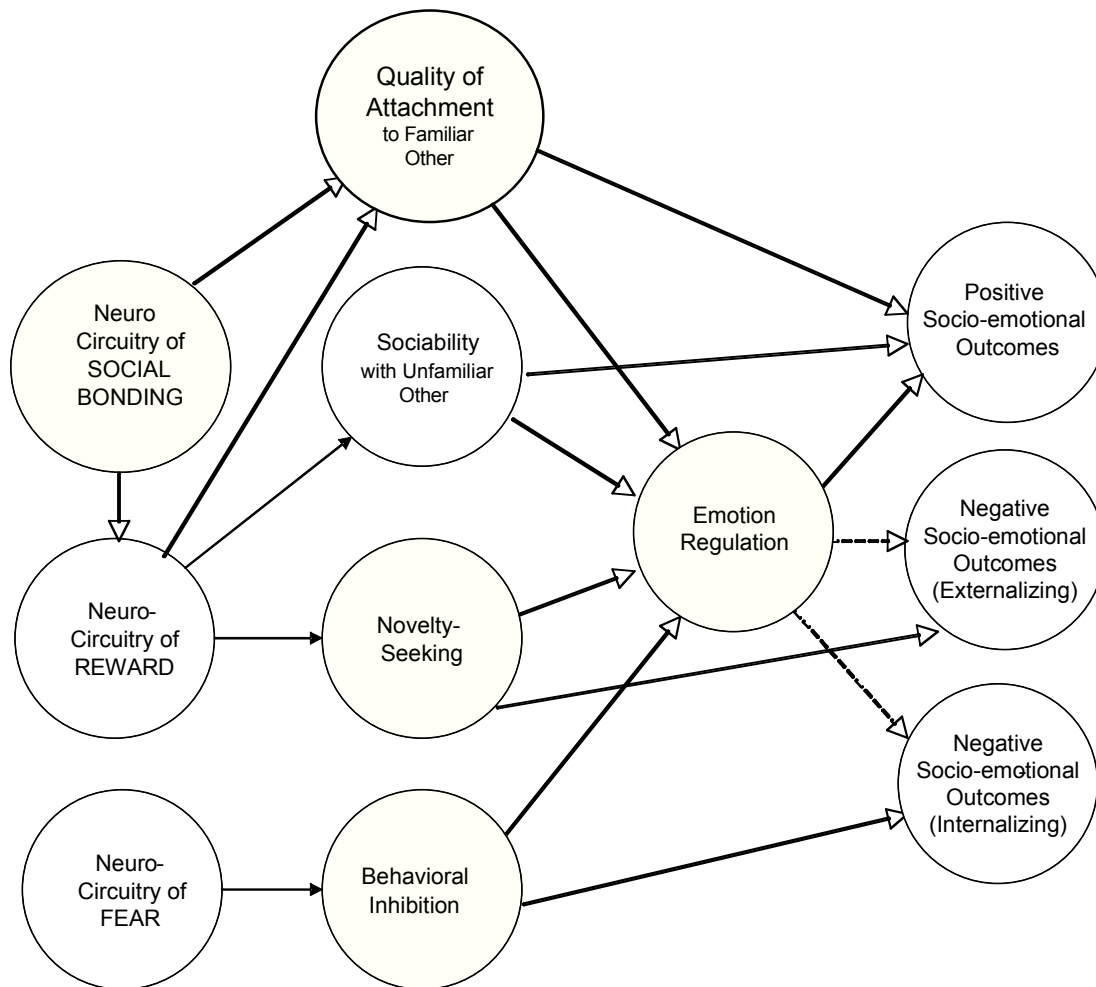
4.3.1 Components in the Proposed Model

The proposed model contains 10 major components. In the section below, I describe what each of the constructs in the model is hypothesized to reflect and provide reasons for their inclusion in the proposed model.

Neuro-circuitry of Social Bonding

As noted in Chapter 2, the neurohypophyseal peptides of oxytocin and vasopressin have been implicated as the central mediators of complex social behaviors, including affiliation, parental care and territorial aggression (Young, Wang, & Insel, 1998). Also, activation of the hippocampus in the formation of social memories has been implicated in the formation of social bonds (Depue & Morrone-Strupinsky, 2005). In the proposed model, the activity of this circuit is represented in the model by the construct of neuro-circuitry of social bonding.

Figure 1: Model of the Proposed Relations between Neuro-Biology, Temperament, Emotion-Regulation and Socio-Emotional Outcomes



Note. Solid lines indicate paths hypothesized to be positive. Dotted lines indicate paths hypothesized to be negative.

Neuro-circuitry of Reward

As noted in Chapter 2, activation of regions such as the medial orbital frontal cortex, amygdala, and nucleus accumbens via dopamine (DA) have been implicated in the expression of agency and in the approach to rewarding non-social stimuli (see Panksepp, 1998; Rolls, 1999 for extensive reviews). In the proposed model, the activity of this circuit is represented in the model by the construct of neuro-circuitry of reward. Also as discussed in Chapter 2, even though approach to social and non-social cues rely on the same motivational system to propel an organism towards a desired goal, the tendency to approach social versus non-social stimuli may not necessarily be related (Depue & Collins, 1999).

Neuro-circuitry of Fear

As noted in Chapter 3, the amygdala has been associated with the expression of fear. Animal work has shown that nuclei within it receive, either directly or indirectly, an enormous array of convergent sensory information (LeDoux, 1996; LeDoux & Phelps, 2000). Since efferents from these regions synapse onto the hypothalamus, basal forebrain, ventral striatum, and various autonomic centers in the brainstem, the amygdala is an important relay through which external stimuli can influence or modulate cortical, motor, autonomic, and neuroendocrine targets.

Recent work by Davis (1998) suggests that unconditioned fearfulness involves pathways through what has sometimes been termed the “extended amygdala” or bed nucleus of the stria terminalis. These pathways influence activity in the amygdala, and thus a shift in focus from thresholds for activation of the amygdala to thresholds for activation of the extended amygdala. Behavioral inhibition is thought to reflect

unconditioned fear. Activity within this circuit, especially in amygdala and extended amygdala and their efferents, is represented in the proposed model by the construct of the Neuro-Circuitry of Fear.

Exuberance

Several models of Exuberance (Buss & Plomin, 1984; Fox et al., 2001; Pfeiffer et al., 2002) included both sociability and novelty-seeking as central features. Thus, in the proposed model Exuberance was characterized as consisting of two distinct constructs, sociability and novelty-seeking.

Sociability

As discussed in Chapter 3, a review of the literature on social development indicates that smiling, joint attention, imitation, and social referencing are important elements of Sociability (e.g. Feinman & Lewis, 1983; Hornick & Gunnar, 1988; Klinnert, Emde, Butterfield, & Campos, 1986; Rubin et al., 1998; Stern, 1985).

In the proposed model, Sociability is represented as two different interpersonal factors, sociability and quality of attachment. The decision to include two factors to represent Sociability was based on both empirical (e.g. Byrne & Suomi, 1998; Capitanio, 1999; Champoux, et al., 1997; Church & Burke, 1992; Depue & Collins, 1999; Hogan, 1983) and neurobiological (Depue & Morrone-Strupinsky, 2005) work that was outlined in Chapter 2 that supports the notion that Sociability is best conceptualized as consisting of two unique interpersonal domains, one reflecting warmth, affection and the enjoyment of close interpersonal relationships (i.e. quality of attachment to familiar others) and the other reflecting the experience of a sense of

potency in accomplishing goals and attaining social dominance or leadership (i.e. sociability with unfamiliar others).

Only one interpersonal domain of Sociability, sociability with unfamiliar others, was hypothesized to be associated with Exuberance. As reviewed in Chapter 2 the inclusion of only this dimension of Sociability in the construct of Exuberance was based on several lines of evidence. First, the quality of attachment to familiar others is hypothesized to be impacted by oxytocin, vasopressin and dopamine mediated systems while the expression of sociability is hypothesized to be impacted *only* by the activation of the dopamine system (Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005). Also, as noted in Chapter 3, Garstein and Rothbart (2003) reported that the affiliation scale from the Infant Behavior Questionnaire did not load onto the surgency factor but rather loaded onto the emotion regulation/orienting factor. Based on these lines of evidence, sociability with unfamiliar others was hypothesized to be a central feature of Exuberance while the quality of attachment to familiar others was not.

Novelty-Seeking

Several models of Exuberance posit that high motoric activity and intense positive affect during “risky” activities are hallmarks of novelty-seeking (e.g. Fox, Henderson, Rubin, et al., 2001; Rothbart et al., 2001). Also, models of adult personality based on “optimal functioning” suggest that the dopaminergic system of Extraverts is under-aroused, causing them to seek out “risky” activities in order to activate this neural system (Eysenck, 1967; Zuckerman, 1961; 1991). Based on this work, the novelty-seeking construct included in the proposed model is hypothesized

to reflect the expression of appetitive behavior, motor activity and intense positive emotion during “risky” situations.

Behavioral Inhibition

Kagan has theorized that individual differences in infants’ response to novelty were due to variations in the excitability of the central nucleus of the amygdala. Kagan speculates that individual differences in reactivity to sensory stimuli would differentiate behaviorally inhibited infants from all other infants since the central nucleus of the amygdala is activated by sensory input. Kagan therefore hypothesized that infant’s who show a pattern of behavioral inhibition in toddlerhood and childhood would show more reactivity, indexed by negative affect and high motoric activity, to sensory input than all other infants. In particular, Kagan hypothesized that toddlers would show freezing behavior, negative vocalizations and increase autonomic function in response to novelty since this pattern of behavioral and physiological reactivity had been reported in the animal literature as behavioral outputs of the amygdala (see LeDoux, 1996 for extensive review). Therefore, the construct of behavioral inhibition in the current model reflects freezing behavior, negative vocalizations and increase autonomic function in response to novelty.

Emotion-Regulation

Processes associated with emotion-regulation, or behaviors and thoughts that help individuals deal with stressful or distressing situations, may act to either inhibit or augment particular patterns of reactivity in order to promote adaptive behavioral and emotional responsivity (Bridges & Grolnick, 1995; Calkins, 1994; Kopp, 1982,

1989; Mischel, 1973). In the proposed model, the construct of emotion-regulation reflects behaviors and thoughts that help individuals modulate their emotions.

Positive Socio-Emotional Outcomes

In the extant literature, socio-emotional competence is most often conceptualized as reflecting behaviors such as compliance, imitation, pretend play skills, mastery motivation, empathy, emotional awareness and prosocial peer behaviors (Eisenberg & Mussen, 1989; Radke-Yarrow & Zahn-Waxler, 1984; Saarni, 1988; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). In the proposed model, the positive socio-emotional outcome component reflects the expression of this constellation of behaviors.

Negative Socio-Emotional Outcomes

Negative socio-emotional outcomes are most often conceptualized as representing two broad categories, those reflecting externalizing difficulties and those reflecting internalizing difficulties. Behaviors typically associated with externalizing problems include hyperactivity, impulsivity, aggression and defiance (Achenbach, 1966; Achenbach, Edelbrock & Howell, 1987; Carter, Briggs-Gowan, Jones, & Little, 2003). On the other hand, behaviors typically associated with internalizing problems include, depression, withdrawal, anxiety, inhibition to novelty, somatic dysregulation, and sensory sensitivity (Achenbach, 1966; Achenbach et al, 1987; Carter et al., 2003).

The proposed model therefore includes two constructs to reflect both types of negative socio-emotional outcomes. The internalizing construct reflects depression, withdrawal, anxiety, inhibition to novelty, somatic dysregulation, and sensory

sensitivity and the externalizing construct reflects hyperactivity, impulsivity, aggression and defiance

4.3.2 Paths in the Proposed Model

In Figure 1, I propose various relations among the components just described. In this section I will discuss the reasons for including these paths.

Two direct paths from the neuro-circuitry of social bonding are hypothesized. First, a direct path from the neuro-circuitry of social bonding to quality of attachment is hypothesized because affiliatory behaviors have been associated with activation of this circuit in the extant literature on social bonding (Depue & Morrone-Strupinsky, 2005; Insel & Young, 2001).

A direct path from the neuro-circuitry of social bonding to the neuro-circuitry of reward is also hypothesized since there is evidence to suggest that the mesolimbic dopamine reward circuit may mediate the rewarding properties of social interaction via pathways linking the anterior hypothalamus and the ventral tegmental area and the nucleus accumbens shell (Depue & Morrone-Strupinsky, 2005; Panksepp, 1998; Rolls, 1999).

A direct path from the neuro-circuitry of reward component to novelty-seeking is hypothesized since individual differences in approach to novelty have been linked to the function of this system (e.g. see Panksepp for extensive review).

Since activation of the neuro-circuitry of fear has been associated with the expression of fear and behavioral inhibition (LeDoux, 1996; Kagan, 1995) a direct path from the neuro-circuitry of fear construct to behavioral inhibition is hypothesized.

Both quality of attachment and sociability constructs were hypothesized to be directly and positively related to positive socio-emotional outcomes. Thus direct paths from quality of attachment to positive socio-emotional outcomes and from sociability to positive socio-emotional outcomes were included in the model. The inclusion of these paths was based on empirical work that has demonstrated these behavioral phenotypes promote positive social and emotional outcomes (e.g. Denham et al., 1990; Eisenberg et al., 1998; Rubin et al., 1995; Schaffer, 1966).

The quality of attachment and sociability constructs were also hypothesized to impact socio-emotional outcomes indirectly. Specifically, emotion regulation was hypothesized to mediate the relations between quality of attachment and sociability and positive socio-emotional outcomes and negative socio-emotional outcomes. Mediation was hypothesized since emotion regulation was hypothesized to play a causal role in the relationship between quality of attachment and sociability and later socio-emotional outcomes.

The hypothesis that emotion regulation would mediate the relations between quality of attachment and sociability and later socio-emotional outcomes was supported by studies of Extraversion (Newman, 1987a; 1987b; Nicols & Newman, 1986) and the work of a number of theorists (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998) which suggest that the relations between Exuberance and later positive *or* negative socio-emotional outcomes may be mediated by emotion regulation skills (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998).

Novelty-seeking was hypothesized to be directly and positively related to negative socio-emotional outcomes of an externalizing nature. This path was hypothesized because the work of Hirschfeld and his colleagues (Hirschfeld et al., 1992) indicates that children who display strong approach tendencies to novel or ambiguous stimuli in the laboratory are more likely to be diagnosed with oppositional disorder compared to other children. This path was also included because a number of studies have also reported direct links between strong appetitive behavior and externalizing problems (Achenbach & Edelbrock, 1983; Cicchetti & Toth, 1991; Oldehinkel, et al., 2004; Hirschfeld et al., 1992; Wertlieb, et al., 1987).

It was posited that emotion regulation would also mediate the relations between novelty-seeking and socio-emotional outcomes. That is, novelty-seeking was expected to be associated with negative socio-emotional outcomes of an externalizing nature due to low emotion regulation whereas novelty-seeking was expected to be associated with positive socio-emotional outcomes due to strong emotion regulation. Mediation was hypothesized since emotion regulation was hypothesized to play a causal role in the relationship between novelty-seeking and later socio-emotional outcomes. Work on adult Extraversion (Newman, 1987a; Nicols & Newman, 1986) and conceptualizations of temperament put forward by a number of theorists (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998) were the basis for this hypothesis.

The behavioral inhibition construct was hypothesized to be directly and positively related to negative socio-emotional outcomes of an internalizing nature. This direct path was hypothesized since several studies have found strong

associations between behavioral inhibition and later internalizing behavior problems and (Biederman et al., 1993; Schwartz, Snidman, & Kagan, 1999). For example, work by Schwartz et al. (1999) reported that 2-years that had been classified as behaviorally inhibited at 2-years of age reported being more socially anxious compared to children who has been identified as disinhibited at 2-years of age. Also, an indirect path between the behavioral inhibition component and negative socio-emotional outcomes of an internalizing nature was hypothesized. This path was included since there is work indicating that negative temperament predicts more problem behaviors with declining levels of regulation (e.g. Eisenberg et al., 1996).

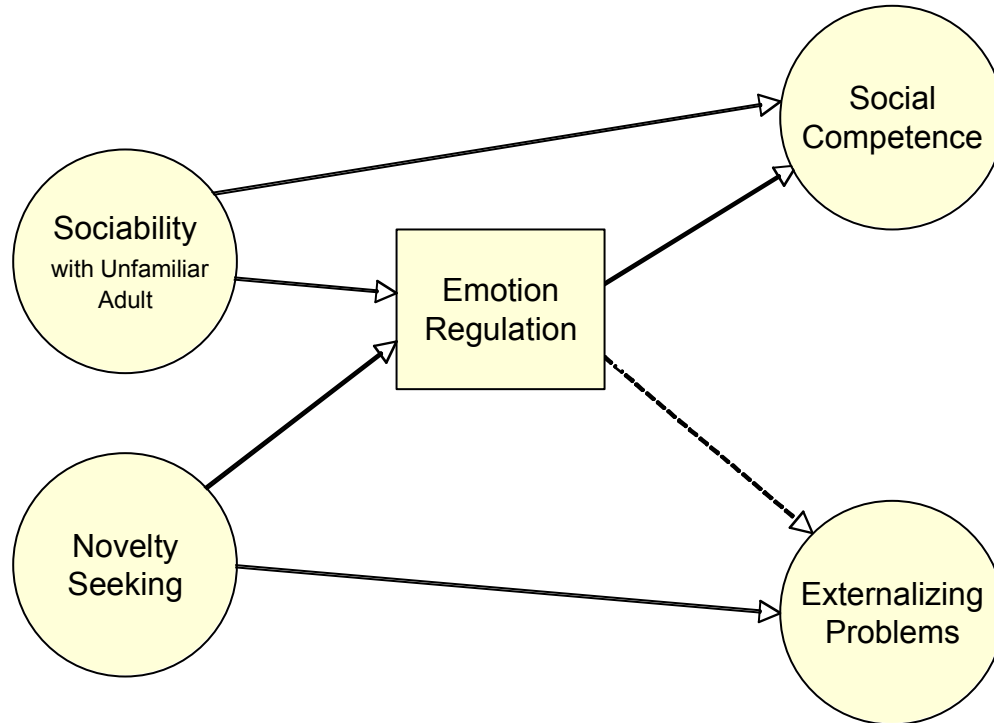
In the proposed model, emotion regulation was hypothesized to have a direct effect on both positive and negative socio-emotional outcomes; however, the path between emotion regulation and positive socio-emotional outcomes was hypothesized to be positive whereas the path between emotion regulation and the two negative socio-emotional outcomes were hypothesized to be negative. Therefore, strong emotion regulation was expected to be associated with greater positive socio-emotional outcomes whereas, poor emotion regulation was expected to be associated with more negative socio-emotional outcomes. These paths were added to the model since empirical work indicates that good emotion regulation is related to positive socio-emotional outcomes (e.g. Eisenberg et al., 1993; Eisenberg, et. al, 1996; Kruger, et. al., 1996; Rubin, & Krasnor, 1986) and that low emotion regulation is associated with negative socio-emotional outcomes (e.g. Achenbach, 1966; Achenbach, et al., 1987; Carter et al, 2003).

4.4 Overview of the Portion of the Model Assessed

It was beyond the scope of the current study to include all the aspects of the proposed model due to the logistical constraints of examining the neurobiological circuitry in human children and due to the burden on participants in terms of time and effort. As a result, only a section of the proposed model was examined (Figure 2). This portion of the model was selected since it contained both of the constructs which were hypothesized to be the central features of Exuberance, sociability and novelty-seeking, as well as both aspects of socio-emotional functioning that have been associated with this temperamental profile.

The constructs included in the assessed model were not meant to be exhaustive. Instead, the model represents an initial step towards explicating the relations between Exuberance (i.e. novelty-seeking and sociability), and later emotion regulation and socio-emotional outcomes. For this reason the portion of the model assessed only includes sociability with one type of social partner (i.e. unfamiliar adult), only one type of positive socio-emotional outcome (i.e. social competence) and only one type of negative socio-emotional outcome (i.e. externalizing behavioral problems). Potentially, future works can expand on this model to include other types of sociability (i.e. peers), aspects of regulation (i.e. executive inhibitory process), classes of positive socio-emotional outcomes (i.e. mastery motivation), or negative (i.e. peer rejection) socio-emotional outcomes, which may be related to Exuberance.

Figure 2: Hypothesized Structural Model



Note. Solid lines indicate paths hypothesized to be positive. Dotted lines indicate paths hypothesized to be negative.

4.4.1 Components in the Assessed Model

Novelty-Seeking

Since there are currently no standardized behavioral assessments of novelty-seeking for toddlers I reviewed the temperament literature to identify behaviors that have been associated with novelty-seeking in young children. This review yielded two behaviors, high motoric activity and intense positive affect during “risky” activities as hallmarks of novelty-seeking (e.g. Fox, Henderson, Rubin, et al., 2001; Rothbart et al., 2001). Measures of motor activity, positive emotion and risk-taking were therefore utilized to index the novelty-seeking component in the assessed portion of the model.

Sociability with an Unfamiliar Adult

There are currently also no standardized behavioral assessments of sociability in toddlerhood. A review of the literature on social development indicated that social referencing and shared positive emotion were important elements of sociability (e.g. Feinman & Lewis, 1983; Hornick & Gunnar, 1988; Klinnert, Emde, Butterfield, & Campos, 1986; Stern, 1985). In addition, the current study examined sociability with only one type of social partner, namely an unfamiliar adult. Therefore, in the assessed model, measures of social referencing and positive emotion directed towards an unfamiliar adult were included in the construct of sociability.

Emotion Regulation

One scale from the Childhood Behavior Checklist (CBCL; Achenbach & Rescorla, 2000), emotional reactivity, was employed as the measure of Emotion Regulation. This variable was chosen to index emotion regulation since it would provide an index of how often a toddler was unable to control their emotions. A second reason this scale item was chosen was because maternal report of emotion dysregulation had been a previous study that also looked at the relations between sociability, emotion regulation, and socio-emotional outcomes (Rubin et al., 1995). Therefore, in the assessed model, the inverse score of the CBCL emotional reactivity scale item was included as a measured variable of emotion regulation.

Social Competence

Only one potential positive socio-emotional outcome, social competence, was included in the assessed model. In the extant development literature, social competence has been conceptualized as consisting of two domains: (1) the child's

success in meeting their personal goals and, (2) the child's interpersonal connectedness (Rose-Krasnor, 1997). Since the current study focused on the Exuberance, which includes the trait of sociability, the current study focused on indexing the child's interpersonal connectedness. Thus, three scales from the Competence domain of the Infant-Toddler Social and Emotional Assessment (ITSEA; Carter & Briggs-Gowan, 2003) were utilized to index this aspect of social competence. The three scales were: (1) imitation/play, (2) empathy, and (3) prosocial peer relations.

Externalizing Problems

In order to index externalizing problems, three scales from the Externalizing domain of Childhood Behavior Checklist (CBCL; Achenbach & Rescorla, 2000) were used, including: (1) oppositional defiance problems, (2) aggressive behavior, and (3) attention deficit hyperactivity problems. I decided to use these three scales because these behaviors have traditionally been used to index externalizing behavior and have continued to be included in current assessments of externalizing behavior (Achenbach, 1966; Achenbach et al., 1987; Carter, Briggs-Gowan, et al., 2003). Also, I did not include all of the scales from the CBCL externalizing factor as some of these scales (i.e. attention problems) appeared to be less related to the types of externalizing behaviors (i.e. anger and impulsivity) typically associated with Exuberance (Fox, Henderson, Rubin, et al., 2001; Rothbart et al., 2000).

4.4.2 Paths in the Portion of the Model Assessed

In Figure 2, I propose a number of relations amongst the components just described. Since the paths between these constructs were described in great detail above, I will only briefly review the paths in the assessed model.

Drawing on: (1) models of Exuberance which include sociability, novelty-seeking and positive emotion as core features of Exuberance (Buss & Plomin, 1975; Fox, Henderson, Rubin, et al., 2001; Pfeiffer et al., 2001; Rothbart et al., 2001); (2) work suggesting that positive emotion may be context specific (e.g. Askan & Kochanska, 2004); and (3) adult personality literature which points towards the possibility that Extraversion consists of several unique facets (Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005), I proposed that Exuberance would be best conceptualized as two unique constructs, novelty-seeking and sociability with an unfamiliar adult. Furthermore, I hypothesized that these constructs would be orthogonal. That is, I posited that the expression of approach and positive emotion towards social and non-social stimuli would be unrelated.

In the assessed model, emotion regulation was hypothesized to have a direct effect on both social competence and on externalizing problems; however, the path between emotion regulation and social competence was hypothesized to be positive whereas the path between emotion regulation and externalizing problems was hypothesized to be negative. Therefore, strong emotion regulation was expected to be associated with higher social competence whereas, poor emotion regulation was expected to be associated with higher externalizing problems. These paths were added to the model since empirical work indicates that good emotion regulation is related to

positive socio-emotional outcomes (Eisenberg et al., 1993; Eisenberg et al., 1996; Kruger et al., 1996; Rubin & Krasnor, 1986) and that low emotion regulation is associated with negative socio-emotional outcomes (Achenbach, 1966; Achenbach, et al., 1987; Carter et al., 2003).

Sociability with an unfamiliar adult was hypothesized to be directly and positively related to social competence. Support for the inclusion of this path was garnered from empirical work that has demonstrated this link (Denham et al., 1990; Eisenberg et al., 1998; Schaffer, 1966).

Sociability with an unfamiliar adult was also hypothesized to impact social competence indirectly. Specifically, emotion regulation was hypothesized to mediate the relation between sociability with an unfamiliar adult and later social competence, and sociability with an unfamiliar adult and later externalizing problems. These paths were added to the model based on studies of Extraversion (Newman, 1987a; Nicols & Newman, 1986), the work of a number of theorists (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998) which indicate that the relations between Exuberance and later positive *or* negative socio-emotional outcomes may be mediated by emotion regulation skills.

Novelty-seeking was hypothesized to be directly and positively related to externalizing problems. The path was hypothesized because an empirical study by Hirschfeld et al. (1992) reported that children who display strong approach tendencies to novel or ambiguous stimuli in the laboratory are more likely to be diagnosed with oppositional disorder compared to other children and because a number of studies

have also found this association (Achenbach & Edelbrock, 1983; Cicchetti & Toth, 1991; Oldehinkel et al., 2004; Hirschfeld et al., 1992; Wertlieb, et al., 1987).

It was posited that that emotion regulation would also mediate the relations between novelty-seeking and later externalizing problems, and novelty-seeking and later social competence. That is, novelty-seeking was expected to be associated with externalizing problems due to low emotion regulation whereas novelty-seeking was expected to be associated with social competence due to strong emotion regulation. The inclusion of this indirect path was based on studies of Extraversion (Newman, 1987a; Nicols & Newman, 1986), the work of a number of theorists (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998) that suggest that emotion regulation skills may mediate the relations between novelty-seeking and later socio-emotional outcomes.

4.5 Research Questions

1. What is the factor structure of Sociability?

It was hypothesized that confirmatory factor analysis would yield a two-factor model of Sociability in which one factor would reflect attachment to the caregiver while the other factor would reflect sociability with an unfamiliar adult.

2. What is the factor structure of Exuberance?

It was hypothesized that an oblique two-factor model of Exuberance reflecting the constructs of novelty-seeking and sociability with an unfamiliar adult would fit the data better than an oblique two-factor model of Exuberance reflecting novelty-seeking and sociability with an unfamiliar adult, a one-factor model reflecting positive emotion or a one-factor model reflecting approach motivation. Positive

emotion during the display of novelty-seeking behavior and positive emotion during the display of sociable behavior towards an unfamiliar adult were hypothesized to load onto the novelty-seeking and sociability with and unfamiliar adult factors respectively.

3. What are the relations between Exuberance and behavioral inhibition?

It was hypothesized that the latent variables of sociability and novelty-seeking (i.e. Exuberance) would not be related to behavioral inhibition.

4. What is the relation between the TBAQ scale scores and the two-factor model of Exuberance?

It was hypothesized that because four (i.e. activity level, positive affect interest and anger) of the five TBAQ scale items were questions largely pertaining to novel stimuli that these items would load onto the novelty-seeking factor and that the fifth TBAQ scale, social fear, would load negatively onto the sociability factor.

5. What are the relations between Exuberance (i.e. sociability and novelty-seeking) and later emotion regulation, social competence, and externalizing problems?

It was hypothesized that sociability with an unfamiliar adult and novelty-seeking would both be directly and positively associated with emotion regulation.

Emotion regulation was hypothesized to have a direct effect on both social competence and on externalizing problems; however, the path between emotion regulation and social competence was hypothesized to be positive whereas the path between emotion regulation and externalizing problems was hypothesized to be negative. Emotion regulation was also hypothesized to mediate the relations

between novelty-seeking and later externalizing problems and social competence, as well as to mediate the relations between sociability with an unfamiliar adult and later externalizing problems and social competence. Novelty-seeking was posited to predict later externalizing problems and sociability with an unfamiliar adult was hypothesized predict later social competence.

CHAPTER 5: METHODS

In this chapter, information about the sample, measures and tasks are described. Additionally, the procedures used to conduct the study, as well as the details of the data analysis plan are discussed.

5.1 Participants

60 toddlers participated in the study (23 were male and 37 were female). Participants were part of a larger longitudinal study examining the relations between temperament and social and emotional development. Participants were mailed a cover letter, a brief survey, and a business reply envelope shortly after the child's birth. The survey requested information about the birth of the child, including method of delivery, birth complications, and number of days in the hospital, and any illness or medical problems. Families that were interested in participating in the study were asked to complete the survey and return it using a postage-paid business reply envelope. Parents whose infants did not have any major birth complications or illness were contacted via telephone, given the full details of the visit, and asked if they would like to take part in the study. Those interested in participating were then scheduled for a 4-month laboratory visit, a 9-month laboratory visit and 9-month home visit prior to being scheduled for the 24-month and 36-month visits to the laboratory.

The factor structure of Exuberance (i.e. sociability, novelty-seeking), and the convergence of laboratory and caregiver report Exuberance, were examined at 24-month-olds because this age represents a developmental time period when toddlers

are beginning to show a greater repertoire of social behavior such as sharing, imitation and following (e.g. Hay, 1977, 1985; Hay, Murray, Ceecire, & Nash, 1985; Hay & Ross, 1982; McCall, Parke, & Kavanaugh, 1977). Therefore, by focusing on two-year olds, the current study made possible the extension of the literature with regard to temperament and the comparison of models of Exuberance to models of Extraversion and motivation from the adult literature.

A longitudinal design was used to examine the relations between Exuberance, emotion regulation, social competence and externalizing behaviors. A longitudinal design was employed so that the predictive utility of Exuberance on later social and emotional outcomes could be examined. This would also extend the literature on temperament since no studies to date have examined the *longitudinal* relations between different facets of Exuberance and later emotion regulation, externalizing behavior and emotion regulation. Also, no studies have examined these relations in a sample this young.

The current study did not examine gender differences in Exuberance since there is evidence to suggest that the behaviors typically associated with Exuberance show little gender differences especially in infancy and toddlerhood (Bates, 1987; Eatons & Enns, 1986; Else-Quest, Hyde, Goldsmith & Van Hulle, 2006; Maccoby & Jacklin, 1974; Rothbart, 1986). For example, in a recent meta-analysis of gender differences in temperament, Else-Quest et al. (2006) reported negligible gender differences in smiling and positive affect, approach, sociability and shyness and a very small gender difference in motor activity (i.e. slightly greater motor activity in males) for children within this age range.

5.2 Procedures for 2-year Data Collection

Upon arriving at the lab, the mother was debriefed about the visit protocol. Once the debriefing and signing of the consent forms was completed, mother and toddler were brought into the adjoining playroom by the experimenter. The playroom contained five different types of toys, which were scattered on the floor, and a chair for the mother to sit on. The experimenter left the toddler and mother alone in the playroom for 5-minutes to play freely with the toys so that the toddler could become familiar with the room. Following this “free-play” session, the toddler was invited to participate in a sequence of activities while the mother completed the Toddler Behavior Assessment Questionnaire. In order to facilitate the toddler’s participation in the laboratory tasks, caregivers were instructed to interact with their toddler as little as possible

The seven activities detailed in the following sub-sections were designed to elicit approach behavior and positive emotion in three different contexts: (1) to play with an unfamiliar adult (social), (2) to play on physically “risky” apparatus (novelty-seeking) and; (3) to explore unfamiliar objects (exploration).

5.2.1 Stranger (Social Episode)

An unfamiliar experimenter entered the room with a large Rubbermaid container that held the stimuli for the first two episodes of the visit. The experimenter sat quietly for one minute and avoided making eye contact with the toddler. The first part of the episode would therefore end if either 1-minute of time elapsed or if the toddler persistently touched or talked to the unfamiliar experimenter. Next, the unfamiliar experimenter would remove a toy dump truck and blocks from the large

rubber maid container and would begin playing with it by dumping and reloading the blocks several times. If after 1-minute the toddler still did not approach the unfamiliar experimenter or toy truck, the experimenter would invite the toddler to join in playing by saying “Would you like to come help me pick up the blocks?” If the toddler did not approach the unfamiliar experimenter would once again verbally prompt the toddler. If the toddler did approach then they would be allowed to play with the dump truck and blocks for one minute.

5.2.2 Robot (Exploration Episode)

The experimenter placed a toy robot in front of the toddler. The toy robot was battery operated and thus made loud noises and was able to walk forward. The experimenter left the robot on for 2-minutes so that the toddler could play with the toy or would turn the robot off if the toddler exhibited marked distress for more than 15-seconds.

5.2.3 Tunnel (Novelty-Seeking Episode)

A tunnel was brought into the room by the experimenter and the toddler was asked to crawl through the tunnel. If the toddler did not approach the tunnel they were prompted a maximum of two more times to crawl through the tunnel. If the toddler immediately entered and crawled through the tunnel they were able to play with it for an additional minute.

5.2.4 Black Box (Exploration Episode)

An opaque black box with a small partially covered hole was presented to the toddler. Unbeknownst to the toddler there was a small stuffed dog inside the box.

The experimenter then asked the toddler if they wanted to reach inside. The episode would end if either the child pulled out the toy, or if they had been prompted two more times to put their hand inside the box.

5.2.5 Mattress (Novelty-Seeking Episode)

A mattress was placed in front of a three step stool in the playroom. The experimenter would walk up to the top step and say, “I’m going to jump off this” and then proceed to jump off the steps. Next, the experimenter asks the toddler if they would like to try. The episode concludes once the toddler makes two jumps or if the toddler does not approach the steps after three prompts.

5.2.6 Poppers (Exploration Episode)

The toddler is instructed by the experimenter to stand on a carpet square. The experimenter then asks the toddler to cover their ears since they are going to show them something that will make a loud bang. The experimenter then pulls the string at the end of a popper that releases confetti and that makes a big bang. The experimenter then asks the toddler if they would like the experimenter to do it again. The episode ends with either the experimenter popping an additional popper or when the toddler tells the experimenter that they do not want to see another popper go off.

5.2.7 Vacuum (Exploration Episode)

The experimenter notifies the toddler that someone is going to enter the room to clean up all the confetti at which point an experimenter enters the room and vacuums all of the confetti scattered on the floor by the popper(s).

5.2.8 The Toddler Behavior Assessment Questionnaire

The Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996) is a 111-item questionnaire that can be completed by parents or caregivers that know the toddler in a family-like setting. In the current study the mother completed the TBAQ during the 24-month laboratory visit. Mothers were asked to rate items on a seven-point scale from “not true” to “always” that describes their toddler’s behavior within the last month.

The TBAQ yields five scales including: (1) activity level, (2) positive affect, (3) social fear, (4) interest and, (5) anger. Goldsmith (1986) reports acceptable internal consistency ($\alpha = .78-.89$) and low to moderate test-retest stability of the five scales after 2.5 years ($r = .06-.54$).

5.3 Procedure for 3-year Data Collection

When their child was approximately 36-months of age, caregivers were once again contacted about coming to the laboratory. If they agreed to participate, caregivers and toddlers returned to the lab. Upon arriving at the lab, the mother was debriefed about the visit protocol. Once the debriefing and signing of the consent forms was completed, the caregiver and toddler were brought into the adjoining playroom by the experimenter and the toddler was invited to participate in several activities that were not part of current study. During this time the mother completed two questionnaires, the Child Behavioral Checklist and the Infant-Toddler Social and Emotional Assessment.

5.3.1 The Child Behavior Checklist

The Child Behavior Checklist (CBCL/1.5-5; Achenbach & Rescorla, 2000) consists of 113-items and can be completed by the child’s caregiver. In the current

study the mother completed the CBCL during the 36-month laboratory visit.

Respondents are asked to rate items on a three-point scale from “not true” to “very true” that rates the toddler’s behavior within the past two-months. The CBCL assess three broad dimensions of behavior including: (1) externalizing, (2) internalizing, and (3) total problems. Achenbach and Rescorla (2000) report acceptable internal consistency ($\alpha = .90-.92$) and very good test-retest stability after 8 days ($r = 0.68-0.92$).

5.3.2 The Infant-Toddler Social and Emotional Assessment

The Infant-Toddler Social and Emotional Assessment (ITSEA; Carter & Briggs-Gowan, 2003) is 166-item questionnaire that can be completed by any caregiver who knows the toddler in a family-like setting. In the current study the mother completed the ITSEA during the 36-month laboratory visit. Respondents are asked to rate items on a three-point scale from “not true” to “very true” that rates the toddler’s behavior within the last month. The ITSEA assess four broad dimensions of behavior including: (1) externalizing, (2) internalizing, (3) dysregulation, and (4) competencies. Carter & Briggs-Gowan (2003) report acceptable internal consistency for the scales ($\alpha = .59-.84$) and adequate test-retest stability after 44 days ($r = 0.80-0.90$).

5.4 Coding of Behavior during Standardized Episodes in the Laboratory

5.4.1 Overview of the Behaviors Coded

During each of the episodes noted above, the following behaviors were coded at 10-second epochs the: (1) intensity of positive emotion expressed during interaction with the experimenter, (2) number of references to the experimenter, (3) the vigor of approach to the stimulus, (4) intensity of positive emotion expressed

during play with the stimulus, (5) duration of proximity to the caregiver, (6) latency to first vocalization and, (7) latency to touch the stimulus. Also, the total number of times the toddler jumped from the top of the steps and the number of times the toddler climbed through the tunnel was tallied. Table 5 contains a brief outline of the coding scheme used to code the behaviors described above.

5.4.2 Reliability

Two individuals were responsible for coding all of the observed behaviors from videotape. Inter-coder reliability was assessed using a randomly selected group of children, totaling approximately 20% of the sample. Cohen's Kappa was used to compute agreement between observer pairs and ranged between $K=.69-.98$. Inter-coder disagreements were resolved by review and discussion. Specifically, both coders reviewed each of the cases used to ascertain reliability simultaneously and disagreements were resolved when both coders were in agreement about a particular score.

5.5 Data Analysis

5.5.1 Preliminary Data Analysis

Prior to beginning the statistical analyses, descriptive statistics (e.g. mean, standard deviation, minima and maxima) were calculated. Histograms were produced in order to inspect the data for inadequate variance and outliers. A determination of inadequate variance was based on a cutoff of 50; if 50 participants did not have a score of greater than 0 on a particular variable then it was removed from further analysis. All of the variables derived from the vacuum episode were excluded since there was no variance associated with these variables. No other variables from any of

the other episodes were removed due to inadequate variance or due to significant deviation from other scores.

In order to aggregate the data collected via behavioral observations all of the behavioral variables were pro-rated (i.e. total score/total of completed epochs) and then summed according to context (e.g. social, novelty-seeking and exploration) for each of the seven behaviors noted above. As noted above, these scales were aggregated based on the existing literatures pertaining to Exuberance and the adult personality and motivation literatures. The TBAQ, ITSEA and CBCL scale scores were each computed as per the data aggregation procedures outlined by the creators of those measures.

Table 6 lists the means and standard deviations for the study variables. Table 7 provides a table of the correlations amongst these variables.

5.5.2 Item to Factor Assignments and the Emotion Regulation Variable

In the following section, I identify and describe the specific scales that were assigned to each factor. I also identify the scale used to index emotion regulation.

Sociability with Unfamiliar Adult Factor. The scales utilized for the hypothesized sociability with an unfamiliar adult factor included: (1) the intensity of joy expressed towards the experimenter during the social episodes, (2) the intensity of joy expressed towards the experimenter during the novelty-seeking episodes, (3) the intensity of joy expressed towards the experimenter during the exploration episodes, and (4) the total number of references to the experimenter during the social episodes.

Table 6: Means and Standard Deviations of Study Variables

Variable	Mean	Std. Deviation
Joy with the Experimenter (Social)	0.11	0.26
Joy with the Experimenter (Novelty-Seeking)	0.33	0.40
Joy with the Experimenter (Exploration)	0.34	0.43
Frequency of References to the Experimenter (Social)	0.22	0.23
Joy (Novelty-Seeking)	0.51	0.56
Number of Turns (Novelty-Seeking)	2.10	1.16
Vigor of Approach (Novelty-Seeking)	2.21	0.81
Joy with Mom (Social)	0.07	0.18
Joy with Mom (Novelty-Seeking)	0.21	0.31
Joy with Mom (Exploration)	0.06	0.11
References to Mom (All Episodes)	0.12	0.08
Duration of Proximity to Mom (Exploration)	0.21	0.24
Latency to Touch Stimulus (Exploration)	0.51	0.27
Latency to Vocalize (Exploration)	0.42	0.34
TBAQ Activity	4.27	0.42
TBAQ Pleasure	5.19	0.59
TBAQ Social Fear	3.59	0.41
TBAQ Interest	3.87	0.39
TBAQ Anger	3.51	0.53
CBCL Emotion Regulation	-0.63	0.69
CBCL Oppositional Defiance	3.55	2.52
CBCL Aggressive Behavior	4.34	0.53
CBCL Attentional Deficit	4.37	2.16
ITSEA Play	1.63	0.28
ITSEA Empathy	1.60	0.37
ITSEA Peer Relations	1.43	0.36

Table 7: Correlations between Study Variables

Var. #	Variable Name	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	
1	Joy with the Experimenter (Social)	.59**	.53**	.28*	.15	-.03	-.06	.60**	.09	-.04	-.07	-.09	-.15	-.06	-.11	-.11	.06	.01	-.12	.22	-.14	-.21	-.17	.12	-.06	.15	
2	Joy with the Experimenter (Novelty-Seeking)		.67**	.34*	.11	-.04	.05	.44**	.07	.08	-.08	.00	.00	-.27*	-.29*	-.14	.06	-.16	-.33	.00	-.13	-.18	-.17	.15	.06	.30*	
3	Joy with the Experimenter (Exploration)			.35*	.33*	.05	.11	.22	.03	-.06	-.20	-.13	-.04	-.25	-.03	-.04	.04	-.05	-.14	.18	-.08	-.18	-.15	.19	.09	.21	
4	Frequency of References to the Experimenter (Social)				.08	.04	.20	-.03	.19	-.09	.03	-.08	-.02	.01	-.32*	-.30*	.03	-.04	-.12	.20	-.18	-.10	-.11	.01	.06	.00	
5	Joy (Novelty-Seeking)					.36**	.43**	-.04	.25	.12	-.04	-.37**	-.28*	-.02	.12	.15	-.03	.19	.07	-.03	.20	.11	.14	-.06	.02	-.01	
6	Number of Turns (Novelty-Seeking)						.65**	-.01	.16	-.02	-.17	-.38**	-.57**	.11	.19	.24	.19	.01	-.07	.29*	.08	.14	.13	.17	.21	-.10	
7	Vigor of Approach (Novelty-Seeking)							-.15	.20	.19	-.12	-.51**	-.49**	-.08	.04	.18	.40**	.09	.04	.26	.07	.23	.14	.09	.17	-.07	
8	Joy with Mom (Social)								.17	.00	.21	.09	-.09	-.01	-.12	-.11	.01	-.17	-.10	.01	.06	-.10	-.14	.08	-.08	.22	
9	Joy with Mom (Novelty-Seeking)									.29*	.35**	-.11	-.12	.19	-.17	-.13	.14	-.09	-.08	.04	.05	-.04	-.02	.05	-.10	-.01	
10	Joy with Mom (Exploration)										.14	-.09	.07	-.12	-.11	-.03	-.05	-.11	-.16	-.05	-.14	-.11	-.20	-.28*	-.28*	-.16	
11	References to Mom (All Episodes)											.01	.19	.02	-.17	-.20	-.11	.01	-.14	-.27	.15	.15	.13	-.16	-.15	-.13	
12	Duration of Proximity to Mom (Exploration)													.53**	-.14	-.14	-.01	.03	-.18	.20	-.22	-.11	-.01	-.13	.12	-.03	.15
13	Latency to Touch Stimulus (Exploration)														-.15	-.29*	-.19	-.13	-.20	.07	-.26	-.21	.02	-.09	-.09	-.12	-.10
14	Latency to Vocalize (Exploration)															.01	-.25	-.19	.06	.11	.13	.11	-.03	.07	.00	-.14	-.08
15	TBAQ Activity																.34*	.16	.39**	.44**	-.15	.31*	.34*	-.27	-.01	.05	-.32**
16	TBAQ Pleasure																	.32*	.33*	.07	.25	-.36*	.15	-.14	.13	.41**	.22
17	TBAQ Social Fear																	.18	.18	.09	-.02	.33*	.09	.19	.12	.11	
18	TBAQ Interest																		.26	.00	.03	.33*	.10	-.15	-.04	-.01	
19	TBAQ Anger																			.26	.00	.03	.33*	.10	-.15	-.04	-.01
20	CBCL Emotion Regulation																										-.23
21	CBCL Oppositional Defiance																										-.54**
22	CBCL Aggressive Behavior																										-.28*
23	CBCL Attentional Deficit																										.36*
24	ITSEA Play																										.72**
25	ITSEA Empathy																										.61**
26	ITSEA Peer Relations																										-.21
																											-.05
																											-.08
																											.53**
																											.53**
																											.50**

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Quality of Attachment to the Caregiver Factor. The scales utilized for the hypothesized quality of attachment to the caregiver factor included: (1) the intensity of joy expressed towards the caregiver during the social episodes, (2) the intensity of joy expressed towards the caregiver during the novelty-seeking episodes, (3) the intensity of joy expressed towards the caregiver during the exploration episodes, and (4) the total number of references to the caregiver across all episodes. Unlike the sociability with the experimenter factor that only included referencing the experimenter during the social episode, the social referencing item for the attachment to the caregiver factor consisted of an aggregate of social referencing to the caregiver across all contexts. This decision to aggregate references towards the caregiver across all of the episodes and not to do so for the referencing the experimenter item was due to the fact that there were no episodes designed to elicit one-on-one interaction between the toddler and the caregiver as was the case with the social episode (i.e. stranger episode in which the toddler and experimenter play with one another).

Novelty-Seeking Factor. The scales utilized for the hypothesized novelty-seeking factor included: (1) the intensity of joy while interacting with the novel risky stimulus, (2) the vigor of approach to the novel risky stimulus, and (3) the number of turns on the novel apparatus (i.e. times crawled through the tunnel and the number of jumps from the top step).

Behavioral Inhibition Factor. The scales utilized for the hypothesized behavioral inhibition factor included: (1) latency to first vocalization, (2) latency in proximity to caregiver, and (3) latency to touch the stimulus during the exploration episodes.

Social Competence Factor. Three scales from the ITSEA competencies domain were utilized to index this behavior. The scales that were included were: (1) imitation/play, (2) empathy, and (3) prosocial peer relations.

Externalizing Problems Factor. Three scales from the CBCL externalizing domain that focused on aggression and anger were utilized to index this behavior. The scales that were included were: (1) aggression, (2) oppositional defiance problems, and (3) attention deficit hyperactivity problems.

Emotion Regulation Variable. CBCL emotion reactivity scale was utilized as an index of emotion regulation. The inverse of this score was computed so that high scores of emotion regulation reflected strong emotion regulation while low scores reflected low emotion regulation.

5.5.3 Overview of Confirmatory Factor Analysis and Structural Equation Modeling

EQS 6.1 was used to model the examined the hypothesized factor structure of Exuberance, and to model the relations between Exuberance and later emotion regulation, social competence, and externalizing problems.

Model Estimation

In performing CFA and SEM, there are several ways that models can be estimated and their fit evaluated. The standard method of estimating free parameters in SEM is to employ maximum likelihood (ML) since there is evidence to suggest

that ML performs well even under less-than optimal analytic conditions such as excessive kurtosis (Satorra & Bentler, 1994) and smaller sample size (Nevitt & Hancock, 2004).

As reviewed by Kline (2004), ML parameter estimates from indicators with severely non-normal distributions can result in: (1) their estimated standard errors being too low (i.e. negatively biased); (2) inflation of Type I error (i.e. rejection of the null hypotheses that the population parameter is zero more often than is correct) and; (3) increases in the value of the model chi-square (i.e. true models will be rejected too often in exact fit tests). Analysis of indicators with severely non-normal distributions can however be conducted via corrected normal theory method. This involves analyzing the original data with ML, or any other normal theory method, but employing robust standard errors and corrected test statistics since these statistics remain robust against non-normality.

In the current study, robust ML procedures were utilized since all of the indicators had severely non-normal distributions. Violation of multivariate normality was assessed via Mardia's coefficient; values exceeding 1.96 indicated significant non-normality.

Model Fit

In order to ascertain the model fit Hu and Bentler (1999) recommend the use of joint criteria. Therefore, in order for a model to be retained in the current study, one of the following sets of joint criteria must have been met: $CFI \geq .96$ and $SRMR \leq .10$, or $RMSEA \leq .06$, $SRMR \leq .10$).

Plausibility of Alternative Models

In CFA and SEM the model fit of two or more models can be compared via tests of model fit. Two different statistics were used to examine the fit between two different types of models. For nested models with non-normal distributions the corrected Satorra-Bentler difference chi-square statistic (Satorra & Bentler, 1999) was utilized to compare model fit. A corrected Satorra-Bentler difference chi-square statistic was utilized since it corrects the degrees of freedom for the bias introduced by severely non-normal distributions in the data (Satorra, 2000). For parsimony reasons the subset model (i.e. the model with less parameters or degrees of freedom) is preferred in cases of a non-significant chi-square difference test (Kline, 2004).

For *non-nested* models with non-normal distributions, or models in which one model is not nested within another, the robust Akaike Information Criterion (AIC) was used to compare model fit. For non-nested models with non-normal distributions the robust AIC is a more appropriate comparison of model fit because it penalizes for over parameterization; unlike the corrected Satorra-Bentler difference chi-square statistic test that partly improves with model complexity. Lower robust AIC values indicated better fit.

Validity and Reliability of Factors

In CFA and SEM the validity and reliability of factors can be examined. In the current study computing the variance extracted assessed factor validity. By convention, the variance extracted should be at least .50. The reliability of a factor can be assessed via the coefficient H statistic (Hancock & Mueller, 2001). Higher values of Coefficient *H* indicate a greater likelihood that the factor will be stable and

replicable, whereas lower values of Coefficient H indicate a lower likelihood that the factor will be stable and replicable.

Advantages and Appropriateness of CFA and SEM

The use of CFA and SEM in the current study was both advantageous and necessary for at least four different reasons. First, CFA and SEM can be used to model latent constructs (i.e. unobserved dimensions) while other statistical techniques such as simple Pearson correlations, ANOVA, or multiple regression cannot. In addition, CFA and SEM can be used to model the relations between latent constructs. Therefore, because many of the constructs included in the current study were latent, the use of CFA and SEM was critical. Without the use of CFA and SEM these latent constructs could not be derived and the relations amongst them could not be examined.

Second, CFA and SEM support a hypothesis testing approach, rather than an exploratory approach, to the analysis of data. This is because entire systems of variables, with researcher specified relations, can be simultaneously tested and then compared to other models. This is because CFA and SEM provide feedback (i.e. model fit indices) about the adequacy of a model as well information about the adequacy of each of the model's components (i.e. factor loadings). Also, the fit of two models can be compared so that the model which best fits the data can be easily identified. This aspect of CFA and SEM is also particularly advantageous to the current study since the fit of several different models of Exuberance were simultaneously examined in order to ascertain which one was the most plausible.

Third, unlike other statistical methods, SEM allows for the simultaneous testing of multiple dependent variables. Given that relations between Exuberance and two outcomes (i.e. social competence and externalizing problems) were to be examined in the current study, the use of SEM was an obvious choice.

Finally, whereas other statistical techniques assume perfect measurement, CFA and SEM account for measurement error. Thus, the use of CFA and SEM in the current study increased the likelihood of obtaining more accurate results.

One potential problem concerning the use of CFA and SEM in the current study was sample size. These statistical techniques are usually regarded as large sample techniques that typically require a recommendation of five cases per parameter to be estimated (Bentler & Chou, 1987). Work by Nevitt and Hancock (2004) however indicates that a two to one case to parameter ratio is adequate at preventing non-convergence or improper solutions, and at yielding adequate empirical power, especially when using ML estimation. Therefore, although the sample size of this study was relatively small compared to studies that would typically employ CFA and SEM analysis, these techniques were still appropriate for the current study.

5.5.4 Confirmatory Factor Analysis and Structural Equation Modeling in the Current Study

Confirmatory Factor Analysis (CFA) was used to examine the first four research questions. Four separate sets of analyses were conducted to test: (1) the factor structure of Exuberance, (2) the relation between Exuberance and behavioral

inhibition, (3) the factor structure of sociability and affiliation, and (4) the relation between TBAQ scale items and Exuberance (i.e. novelty-seeking and sociability).

For each confirmatory factor model, the aggregated scores derived from behavioral observations and/or questionnaire items were assigned to the appropriate factor. Thus, after specifying the models and examining the fit of the models to the data, theoretically justifiable and statistically significant adjustments were made to the model. Specifically, only paths suggested by the Lagrange Multiplier (LM) test were included if there was a reason why the items should be related. For example, if two items contained similar content above and beyond the constructs they were supposed to measure, or shared method variance, were their error terms allowed to covary. Cross-loadings of items onto more than one factor were not considered since all items were theoretically selected to be associated with only one factor.

Structural equation modeling was used to assess the proposed relations between Exuberance (i.e. novelty-seeking and sociability) with respect to later emotion regulation, social competence, and externalizing problems; the fifth goal of the study. The proposed model was tested in a systematic manner using a two-step model testing procedure (Anderson & Gerbing, 1988). The first step involved confirming the factor structure of the variables in the model. This was accomplished by confirming the factor structure of two of the factors in Research Questions 1-3. The factor structure of the remaining two factors was not examined via confirmatory factor analysis prior to the testing of the proposed model because these items were taken from already empirically validated measures (i.e. ITSEA, CBCL).

In the second step of the modeling procedure, I developed and examined the fit of an Initial Measurement Model. Theoretically justifiable changes identified by the LM test to improve fit were then added to create a Final Measurement Model. Since the two models would be nested, the fit of the Initial and Final Measurement Models were compared via the chi-square difference test.

Next the Structural Model (Figure 2), which contained the a priori and theory derived structural hypothesis, was tested. Further re-specification of this model was made via the LM test only if it was theoretically justifiable. Since the models would be nested, this final structural model was then compared with the Final Measurement model via the chi-square difference test. Ideally, the Final Measurement and Structural Models should fit the data equally well.

CHAPTER 6: RESULTS AND DISCUSSION

The first goal of the current study was to determine whether Sociability would be best conceptualized as a single latent factor or as two related latent factors, sociability with and unfamiliar adult and quality of attachment to the caregiver. It was hypothesized that confirmatory factor analysis would yield a two-factor structure of Sociability in which one factor would reflect sociability with and unfamiliar adult while the other would reflect quality of attachment to the caregiver.

The second goal of the current study was to ascertain the factor structure of Exuberance. It was hypothesized that a two-factor model of Exuberance reflecting the constructs of novelty-seeking and sociability with and unfamiliar adult would best fit the data. Positive emotion during the display of novelty-seeking behavior and positive emotion during the display of sociable behavior with an unfamiliar adult were hypothesized to load onto the novelty-seeking factor and sociability with an unfamiliar adult factor respectively.

The third goal of the current study was to ascertain whether Exuberance was its own unique latent construct or whether it was part of the latent construct of behavioral inhibition. It was hypothesized that the latent variables of sociability and novelty-seeking would not be related to behavioral inhibition.

The fourth goal of the study was to examine the relations between the five scale items from the TBAQ and behavioral observations of Exuberance. It was hypothesized that because four (i.e. activity level, positive affect interest and anger) of the five TBAQ scale items were questions largely pertaining to novel stimuli that these items would load onto the novelty-seeking factor and that the fifth TBAQ scale,

social fear, would load negatively onto the sociability with and unfamiliar adult factor.

The fifth goal of the study was to examine the relations between Exuberance (i.e. sociability with an unfamiliar adult and novelty-seeking) and later emotion regulation, social competence and externalizing problems.

Since four sets of confirmatory factor analyses were conducted to address the first four research questions, and the final research question involved modeling the proposed relations amongst Exuberance, emotion regulation, social competence and externalizing behavior problems, the following chapter consists of five major sections. Within each of the first four sections the analyses and results related to each of the four confirmatory factor models is presented. Specifically, the (1) fit of the hypothesized model, (2) reliability of the factors, (3) validity of the factors and, (4) the plausibility of alternative models are detailed. The fifth section includes the analyses and results related to the structural model. In this section Measurement and Structural models are presented and the direct and indirect paths within the model are discussed.

6.1 What is the Factor Structure of Sociability?

The first goal of the current study was to examine the factor structure Sociability in a sample of two-year old children. An orthogonal two-factor model of Sociability, reflecting sociability with an unfamiliar adult and the quality of attachment to the caregiver, was hypothesized. The hypothesized orthogonal two-factor model of Sociability was designed to reflect findings on adult Extraversion (e.g. Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005). Under this

model, Extraversion is conceptualized as consisting of two unique dimensions: affiliation, which reflects warmth, affection, and the enjoyment of close interpersonal relationships, and agency that reflects the experience of attaining social dominance or leadership. Applying this model to Sociability would suggest that the tendency to be sociable towards familiar and unfamiliar others is not necessarily related.

An orthogonal two-factor model was also hypothesized because exploratory factor analysis of IBQ data has yielded a factor structure of Exuberance in which the affiliation item did not load onto the surgency factor but loaded significantly onto the orienting/emotion regulation factor (Garstein & Rothbart, 2003). The loading of affiliation onto an orienting/emotion regulation factor suggests that affiliation is associated with comfort and calm contentment rather than with the surgency factor which is associated with intense positive emotion and the tendency to approach novel stimuli.

Finally, an orthogonal two-factor model would support work indicating that the expression of attachment or affiliatory behaviors are hypothesized to be impacted by both oxytocin, vasopressin and dopamine mediated systems while the expression of sociability or agentic behaviors are hypothesized to be impacted *only* by the activation of the dopamine system (Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005).

6.1.1 Confirmatory Factor Analysis for a Two-Factor Model of Sociability

Confirmatory factor analysis was used to ascertain the fit of an orthogonal two-factor model of Sociability. The two factors of sociability with an unfamiliar

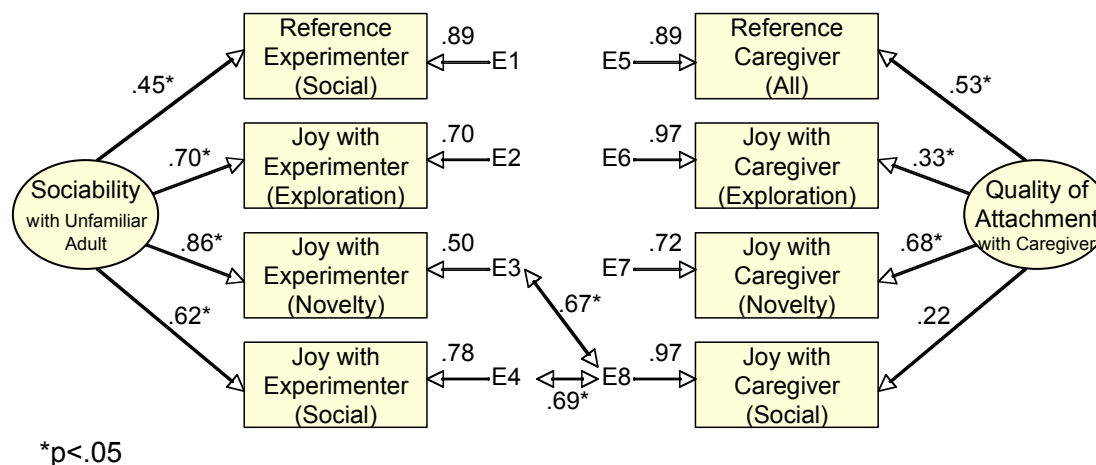
adult and quality of attachment to caregiver were not allowed to covary since it was hypothesized that these two constructs represented two unique facets of Sociability.

For the hypothesized model of Sociability, all items were assigned to one of the two factors. The items assigned to the sociability with an unfamiliar adult factor included the: (1-3) intensity of expressed positive affect towards the experimenter in each of the three (e.g. social, exploration, and novelty-seeking) contexts and, (4) the number of references to the experimenter by the toddler during the social episode.

The items assigned to the quality of attachment to the caregiver factor were: (1) the frequency of references directed towards the caregiver across the three episodes and (2-4) the amount of positive emotion expressed towards the caregiver across three different contexts (e.g. social, exploratory, and novelty-seeking).

Mardia's coefficient was 34.87, indicating excessive kurtosis and thus the need to use robust ML estimation procedures. The fit of the initial model was poor (robust RMSEA= .11; SRMR=.14; Satorra-Bentler $\chi^2= 34.40$; $df=20$) so the Lagrange Multiplier test was used to suggest additional error to error covariance terms that might improve the fit of the model. Error to error covariance terms were only included if there was justification as to why the items may be related. Based on the LM test and on the fact that the items addressed a similar behavior (i.e. positive emotion) two error to error to covariances were added to the model. The fit of this model was good so the model was retained (Table 8). Figure 3 depicts the item to factor assignment and standardized paths (i.e. the amount of correlation attributable to each item) of the orthogonal two-factor model of Sociability.

Figure 3: Standardized Item Loadings for Orthogonal Two-Factor Model of Sociability



6.1.2 Construct Validity and Reliability of Sociability with an Unfamiliar Adult and the Quality of Attachment to the Caregiver

The construct validity for both the sociability with an unfamiliar adult factor and the quality of attachment to the caregiver factor was examined. The variance extracted for the sociability with an unfamiliar adult factor was adequate (.50) while the variance extracted of the quality of attachment to the caregiver factor was low (.23) indicating that the items utilized to index the sociability with an unfamiliar adult factor were good indicators of this latent construct while the items used to index the quality of attachment to the caregiver were not. In particular, the non-significant factor loading of the joy with mom during the social episode indicated that this variable was a poor indicator of the quality of attachment to the caregiver.

The reliability of the both of these factors was also examined via the calculation of Coefficient H (Hancock & Muller, 2001). The Coefficient H value of the sociability with an unfamiliar adult factor was .83 indicating good stability and

replicability of this factor. The Coefficient H of the quality of attachment to the caregiver was .60 indicating only moderate stability and replicability of this factor.

6.1.3 Testing Alternative Models of Sociability

In order to provide additional support for an orthogonal two-factor model of Sociability, two additional plausible models were examined. The first alternative plausible model of Sociability that was examined was a one-factor model of Sociability. This model was designed to test the possibility that Sociability would be better represented as reflecting one general interpersonal domain rather than as two more specific domains. In this model all of the items associated with both sociability with an unfamiliar adult and the quality of attachment to the caregiver were assigned to one factor hypothesized to reflect general Sociability. This model did not fit the data well (Table 8).

Second, an oblique two-factor model of Sociability was examined. A strong relation between the sociability with and unfamiliar adult and the quality of attachment to the caregiver would lend support to the potential influence of a common neuro-circuitry on the expression of sociability with an unfamiliar adult and the quality of attachment to the caregiver. In this model, the two factors of sociability with an unfamiliar adult and quality of attachment to the caregiver maintained the same item to factor assignment as in the hypothesized orthogonal two-factor model of sociability but the two factors were allowed to covary. This model fit the data well (Table 8).

Due to the fact that both the orthogonal and oblique two-factor models of Sociability appeared to fit the data well, the fit of these two models was compared to

one another. Since the two-factor orthogonal model was nested in the two-factor oblique model, the corrected Satorra-Bentler chi-square difference test (Satorra & Bentler, 1999) was utilized to compare model fit. The corrected Satorra-Bentler chi-square difference test was not significant ($\chi^2_{diff} = .461$, $df_{diff} = 1$, $p > .05$). As noted above, the non-significant result of the chi-square difference test indicates that neither model fit the data significantly better than the other, but the fact that the orthogonal two-factor model is more parsimonious compared to the oblique two-factor model, lends additional support for the orthogonal two-factor model of Sociability.

The discriminant construct validity of the sociability with an unfamiliar adult and quality of attachment to the caregiver was also supported via the low correlation (.08) between these two factors.

Table 8: Fit Indices of Alternative Models of Sociability

Model	Satorra-Bentler χ^2 (χ^2)	<i>df</i>	Robust <i>CFI</i> (<i>CFI</i>)	<i>SRMR</i>	Robust <i>RMSEA</i> (<i>RMSEA</i>)
Affiliation and Sociability Orthogonal Two-Factor	20.31 (19.58)	18	.95 (.98)	.08	.04 (.03)
Affiliation and Sociability Oblique Two-Factor	19.53 (19.34)	17	.95 (.97)	.08	.05 (.04)
Sociability One-Factor	30.30 (30.74)	18	.78 (.88)	.11	.10 (.11)

6.1.4 Summary

An orthogonal two-factor model of Sociability best fit the data thus lending support for the notion that sociability with unfamiliar others (e.g. sociability with an unfamiliar adult) may be a distinct trait from the enjoyment of close personal bonds

(e.g. quality of attachment to the caregiver). The discriminant construct validity of the sociability with an unfamiliar adult and quality of attachment to the caregiver was also supported via the low correlation (.08) between these two factors.

Although the plausibility of an orthogonal two-factor model was supported by the data, this finding must be interpreted with caution. Despite the fact that the reliability of the quality of attachment to the caregiver factor was moderate, the construct validity of this factor was quite poor, indicating that the items utilized to index this factor were not good at doing so. The lack of a significant factor loading between the quality of attachment to the caregiver factor and the intensity of expressed positive affect towards mom during the social episode item indicates that this item was not associated with its assigned factor.

The adequate reliability of the sociability with an unfamiliar adult factor indicates that it is likely to be stable and replicable; making this item to factor assignment in future studies feasible. Also, the adequate construct validity of sociability with an unfamiliar adult suggests that it adequately measures this construct.

6.2 What is the Factor Structure of Exuberance?

The second goal of the current study was to examine the factor structure of Exuberance. An orthogonal two-factor model of Exuberance, reflecting novelty-seeking and sociability with and unfamiliar adult, was hypothesized. Two different lines of evidence support the plausibility of an orthogonal two-factor model of Exuberance. First, Buss and Plomin (1975; 1984), Fox et al. (2001) and Pfeiffer et al. (2002) have theorized that sociability is a unique dimension of Exuberance. Second,

the observation by Kochanska and her colleagues (e.g. Askan & Kochanska, 2004) that joy in social-interactive episodes does not load onto the same factor as joy in non-social interactive episodes. This suggests that approach behavior and positive affect across social and non-social contexts may not be related. Third, despite the fact that approach to social and non-social stimuli rely on the same motivational system to propel an organism towards a desired goal, the tendency to approach social versus non-social stimuli may not necessarily be related since individual differences in the sensitivity to social cues may not be related to the sensitivity to non-social cues (Depue & Collins, 1999).

6.2.1 Confirmatory Factor Analysis for a Two-Factor Model of Exuberance

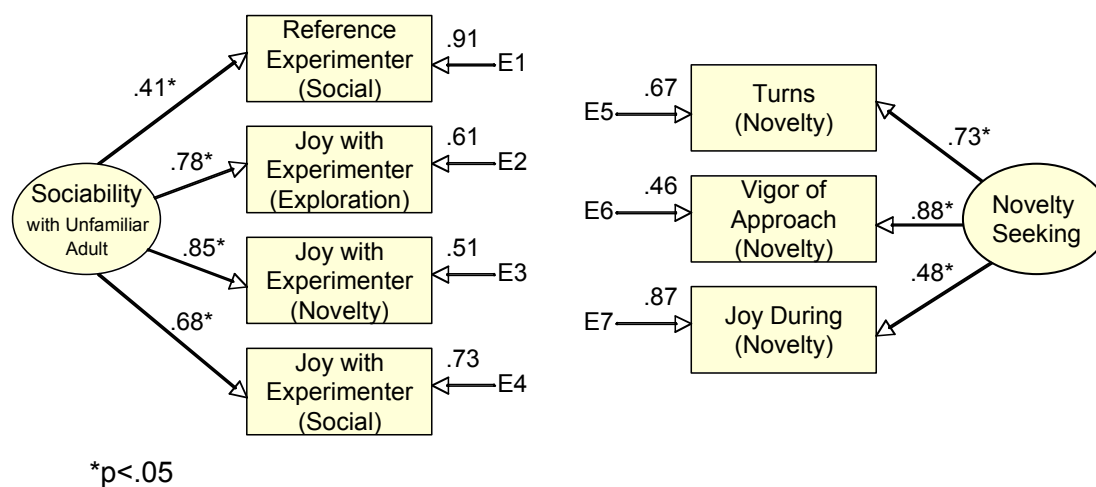
Confirmatory factor analysis was used to ascertain the fit of an orthogonal two-factor model of Exuberance. The two-factors were not allowed to covary since it was hypothesized that novelty-seeking and sociability with an unfamiliar adult represented two unique facets of Exuberance.

For the initial Exuberance model, all items were assigned to one of the two factors, novelty seeking and sociability with an unfamiliar adult. The items assigned to the novelty-seeking factor included the: (1) intensity of expressed joy by the toddler during the novelty-seeking episodes, (2) vigor of approach to the risky novel stimuli, and, (3) number of times the toddler jumped from the steps onto the mattress and went through the tunnel. The items assigned to the sociability with an unfamiliar adult factor were identical to the factor assignment in the previous model.

Mardia's coefficient was 19.37, indicating excessive kurtosis and thus the need to use robust ML estimation procedures. The initial orthogonal two-factor

model fit well and thus could be retained (Table 9). Figure 4 depicts the item to factor assignment and standardized paths of the two-factor model of Exuberance.

Figure 4: Standardized Item Loadings for Orthogonal Two-Factor Model of Exuberance



6.2.2 Construct Validity and Reliability of Exuberance Factors

Since the validity and reliability of the sociability factor were discussed above, only the validity and reliability of the novelty-seeking factor are discussed in this section. The variance extracted from the novelty-seeking factor was .52 indicating that the items utilized to index this factor were adequate indicators of it.

Construct reliability of the novelty-seeking factor was calculated using maximal reliability or Coefficient H (Hancock & Muller, 2001). The Coefficient H value of the novelty-seeking factor was .84 indicating a high likelihood that this factor is stable and replicable.

6.2.3 Testing Alternative Models of Exuberance

In order to provide additional support for an orthogonal two-factor model of Exuberance, three additional plausible models were examined. First, a one-factor

model of general approach motivation was examined. The fit of this one-factor model of Exuberance was looked at in order to test the hypothesis that Exuberance may reflect a general approach motivation. For this alternative model of Exuberance, the items from both the novelty-seeking factor and the sociability with an unfamiliar adult factor were assigned to one factor representing general approach motivation. The fit of this alternative model was poor (Table 9) as indicated by the SRMR value of greater than .09 and a robust RMSEA of greater than .06.

Another one-factor model of Exuberance was also examined. This second one-factor model was designed to examine plausibility of Tellegen's (1985) model of adult Extraversion in which he posited that positive emotion was the core feature of this personality trait. Therefore, the second alternative model of Exuberance was designed to ascertain whether Exuberance could be conceptualized as the tendency to express positive emotion *across* social and non-social contexts. Five items were assigned to a single factor representing Positive Emotion and included the: (1) Intensity of Expressed Positive Affect during Novelty-Seeking episodes, (2) the Intensity of Expressed Positive Affect during the Exploration episodes, (3-5) the Intensity of Expressed Positive Affect towards the Experimenter during the three contexts (i.e. exploration, novelty-seeking and social episodes). The fit of this second alternative model also did not meet the criteria for retention (Table 9).

Finally, a two-factor oblique model of Exuberance was examined. In this case, the two factors, novelty-seeking and, sociability with an unfamiliar adult were allowed to covary. This model fit the data well (Table 9) indicating that an oblique two-factor model of Exuberance was plausible.

Table 9: Fit Indices for Alternative Factor Models of Exuberance

Model	Satorra-Bentler χ^2 (χ^2)	<i>df</i>	Robust <i>CFI</i> (<i>CFI</i>)	<i>SRMR</i>	Robust <i>RMSEA</i> (<i>RMSEA</i>)	Robust <i>AIC</i> (<i>AIC</i>)
Novelty-Seeking and Sociability Orthogonal Two-Factor	13.51 (15.52)	14	1.0 (.98)	.08	.00 (.04)	-14.48 (-12.47)
Novelty-Seeking and Sociability Oblique Two-Factor	12.89 (15.20)	13	1.0 (.98)	.07	.00 (.05)	-13.10 (-10.80)
Positive Emotion One-Factor	9.65 (12.28)	5	.84 (.89)	.09	.12 (.15)	-0.34 (2.28)
Approach Motivation One-Factor	57.87 (57.41)	14	.38 (.61)	.16	.23 (.22)	29.87 (29.41)

Since only the oblique and orthogonal two-factor models of Exuberance fit the data adequately, the fit of these two models was compared. A corrected Satorra-Bentler chi-square difference test (Satorra & Bentler, 1999) was computed since the two-factor orthogonal model was nested in the oblique two-factor model of Exuberance. The corrected Satorra-Bentler chi-square difference test was not significant ($\chi^2_{diff} = 1.00$, $df_{diff} = 1$, $p > .05$). As noted above, the non-significant result of the chi-square difference test indicates that neither model fit the data significantly better than the other, but the fact that the two-factor orthogonal model was more parsimonious compared to the two-factor oblique model, lends additional support for the orthogonal model of Exuberance.

Support for the distinctiveness of novelty-seeking from sociability with an unfamiliar adult was also provided by the non-significant correlation (.08) between the novelty-seeking factor and the sociability with an unfamiliar adult factor.

6.2.4 Summary

Taken together, these findings indicate that an orthogonal two-factor model, reflecting novelty-seeking and, sociability with an unfamiliar adult, of Exuberance is plausible. The adequate reliability of the novelty-seeking factor indicates that is likely to be stable and replicable, making this item to factor assignment in future studies feasible. Also, the construct validity of novelty-seeking suggests that it adequately measures the construct of novelty-seeking. Additional support for the plausibility of an orthogonal two-factor model of Exuberance was provided since this model fit the data better than three alternative plausible models. Support for the distinctiveness of novelty-seeking from sociability with an unfamiliar adult was also provided by the non-significant correlation (.08) between the novelty-seeking factor and sociability with an unfamiliar adult factor.

6.3 What Is the Relation Between Exuberance and Behavioral Inhibition?

The third goal of the study was to examine the relations between the two-factor model of Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult) and behavioral inhibition. It was hypothesized that both the sociability with an unfamiliar adult and the novelty-seeking factors would be unrelated to the behavioral inhibition factor. Specifically, an orthogonal three-factor model, reflecting sociability with an unfamiliar adult, novelty-seeking and behavioral inhibition, was hypothesized to best fit the data.

The hypothesis that novelty-seeking, sociability and, behavioral inhibition would be unrelated was based on two lines of evidence. First, although a number of studies have found that factors similar to novelty-seeking, sociability and, behavioral

inhibition to be unrelated. For example, a study by Cheek and Buss (1981) reported no association between the dimensions of shyness and sociability and a factor analysis of child temperament conducted by Rothbart and her colleagues (Rothbart et al., 2001) found no relations between the surgency factor and the negative emotionality factor.

Second, there is evidence indicating that behavioral inhibition arises from a different set of neuro-circuitry than both novelty-seeking and, sociability. Unlike novelty-seeking and agentic behavior which have been associated with activation of the reward system, behavioral inhibition has been linked to the activation of the central nucleus of the amygdala, anterior and medial hypothalamus, paraventricular grey and the nucleus reticularis pontis caudalis and the release of neurotransmitters such as CRF and ACTH (LeDoux, 1996)

6.3.1 Confirmatory Factor Analysis for the Independence of Novelty-Seeking, Sociability and Behavioral Inhibition

Confirmatory factor analysis was used to ascertain the fit of an orthogonal three-factor model of temperament. The three factors were not allowed to covary since it was hypothesized that they were unrelated.

The item to factor assignments for novelty-seeking and, sociability were identical to those in the previous model. The items assigned to the behavioral inhibition factor included: (1) duration in proximity to mom, (2) latency to vocalize and, (3) latency to touch the novel toy during the exploration episodes.

Mardia's coefficient was 12.26 indicating excessive kurtosis and thus the need to use robust ML estimation procedures. The fit of the initial model was poor (robust

RMSEA= .12; SRMR=.17; Satorra-Bentler $\chi^2= 69.36$; $df=35$). The Lagrange Multiplier test was therefore used to suggest error to error covariance terms that might improve the fit of the model. Error to error covariances were only included if there was theoretical justification as to why the items may be related. This process resulted in the addition of one error covariance term. A covariance was added between expressed joy during novelty-seeking and expressed joy with the experimenter during the novelty-seeking episodes since these items addressed a similar behavior (i.e. positive emotion). After re-specifying the model using the Lagrange Multiplier test, the fit of the orthogonal three-factor model was still not adequate and therefore it could not be retained (robust RMSEA= .12; SRMR=.16; Satorra-Bentler $\chi^2= 65.02$; $df=34$).

In order to maintain the three-factor structure, covariances between the three factors were added to the model. The addition of the three covariances allowed for the possibility that the sociability, novelty-seeking and behavioral inhibition were distinct constructs but that they were also related. The fit of this oblique three-factor model was good so the model was retained (Table 10). Figure 5 depicts the item to factor assignment and standardized paths of this model.

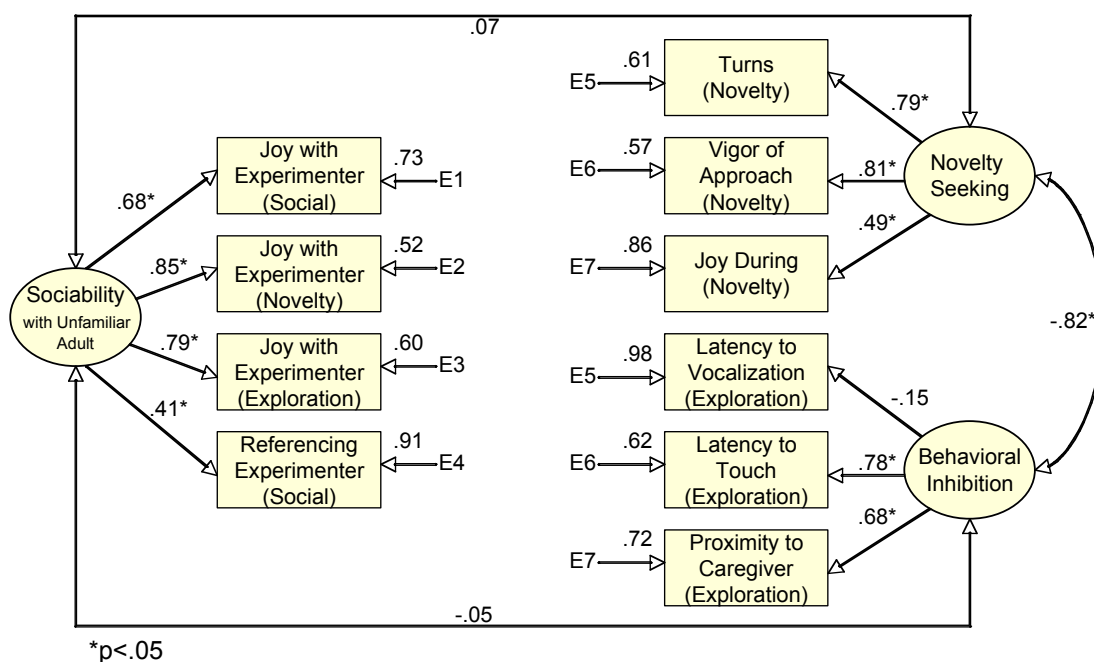
6.3.2 Construct Validity and Reliability of the Behavioral Inhibition Factor

Since the construct validity and reliability of the two Exuberance factors were described above, only the construct validity and reliability of the behavioral inhibition factor will be addressed in this section. The variance extracted from the items associated with the behavioral inhibition factor was quite low (.37) indicating that the items used to measure behavioral inhibition were not adequate. The non-significant

factor loading between the latency to vocalize item and the behavioral inhibition factor indicated that this behavior was not related to the latent construct of behavioral inhibition.

The reliability of the behavioral inhibition factor was calculated using Coefficient H (Hancock & Muller, 2001). The Coefficient H value of behavioral inhibition was .72 indicating moderate stability and replicability of the behavioral inhibition factor.

Figure 5: Standardized Item Loadings for Exuberance and Behavioral Inhibition



6.3.3 Testing Alternative Models

Two additional plausible alternative models of temperament were also examined. Due to the high correlation between the behavioral inhibition and novelty-seeking factors, the 7 items from both factors were assigned to one larger factor

reflecting novelty-seeking/behavioral inhibition. Sociability with an unfamiliar adult was the second factor. As noted in Table 10, this alternative model did not fit the data well indicating that a two-factor model of temperament (i.e. sociability with an unfamiliar adult and novelty-seeking/behavioral inhibition) was not plausible.

Table 10: Fit Indices for Alternative Models of Temperament

Model	Satorra-Bentler χ^2 (χ^2)	<i>df</i>	Robust <i>CFI</i> (<i>CFI</i>)	<i>SRMR</i>	Robust <i>RMSEA</i> (<i>RMSEA</i>)	Robust AIC (AIC)
Sociability, Novelty-Seeking, Behavioral Inhibition Oblique Three-Factor	40.67 (41.65)	32	.93 (.94)	.09	.06 (.07)	-23.32 (-22.34)
Sociability, Novelty-Seeking, Behavioral Inhibition Only Novelty-Seeking and Behavioral Inhibition Covary	41.20 (41.87)	34	.94 (.95)	.09	.06 (.06)	-26.79 (-26.12)
Sociability, Novelty-Seeking/Behavioral Inhibition Orthogonal Two-Factor	45.15 (45.44)	35	.92 (.93)	.09	.07 (.07)	-24.84 (-24.55)

A second plausible model was also examined. This model also consisted of three-factors, sociability with an unfamiliar adult, novelty-seeking, and behavioral inhibition, with only the novelty-seeking and behavioral inhibition factors covarying. This model would support the work of Gray (1970; 1971; 1982; 1987) who has theorized that the behavioral approach and behavioral inhibition systems are mutually competitive. Under this framework, approach to non-social stimuli (i.e. novelty-seeking) and withdrawal from non-social stimuli (i.e. behavioral inhibition) driven by distinct motivational systems that are negatively related. As noted in Table 10, this

alternative model also fit the data well indicating that a three-factor model of temperament in which only novelty-seeking and behavioral inhibition factors were allowed to covary was plausible.

The corrected Satorra-Bentler chi-square difference test (Satorra & Bentler, 1999) was utilized to compare the model fit between the three-factor model in which only novelty-seeking and behavioral inhibition was allowed to covary and the oblique three-factor model because the three-factor model, in which only novelty-seeking and behavioral inhibition was allowed to covary was nested in the oblique three-factor model. The corrected Satorra-Bentler chi-square difference test was not significant ($\chi^2_{\text{diff}} = .30$, $df_{\text{diff}} = 2$, $p > .05$). As noted above, the non-significant result of the chi-square difference test indicates that neither model fit the data significantly better than the other, but the fact that three-factor model in which only behavioral inhibition and novelty-seeking were allowed to covary was more parsimonious compared to the oblique three-factor model, lent additional support for the plausibility of the former of the two models.

6.3.4 Summary

Although an orthogonal three-factor model of temperament was hypothesized, this model did not adequately fit the data. An oblique three-factor model however did fit the data adequately thereby lending support for the notion that novelty-seeking and sociability were distinct from behavioral inhibition even if two of the three factors (i.e. novelty-seeking and behavioral inhibition) were not completely unrelated to one another.

Due to the significant negative correlation between the novelty-seeking and behavioral inhibition factors two additional plausible models were examined. The fit of an orthogonal two-factor model (i.e. novelty-seeking/behavioral inhibition and sociability with an unfamiliar adult) was compared to the fit of three-factor model in which only the novelty-seeking and behavioral inhibition factors were allowed to covary. Given that the three-factor model in which *only* novelty-seeking and behavioral inhibition were allowed to covary best fit the data, additional support for the distinctiveness of these two factors from one another was provided.

Despite the fact that there was support for the plausibility of a three-factor model in which novelty-seeking and, behavioral inhibition are allowed to covary, this finding must be interpreted with caution. Although the behavioral inhibition factor showed moderate reliability, the construct validity of this factor was quite poor. This result was unexpected since the three items assigned to this factor are regularly utilized as indices of behavioral inhibition in the extant literature (Fox, Henderson, Rubin et al., 2001; Kagan et al., 1995). Specifically, the lack of a significant factor loading between the behavioral inhibition factor and the latency to vocalize variable was unanticipated.

6.4 What are the Relations between Behavioral and Questionnaire Assessments of Exuberance?

The fourth goal of the current study was to examine the relations between caregiver report of temperament via the TBAQ and observed Exuberance (i.e. novelty-seeking and sociability).

6.4.1 Confirmatory Factor Analysis of a Two-Factor Model of Exuberance Using Both Questionnaire Items and Behavioral Observation

For the initial two-factor model of Exuberance, all the behavioral and questionnaire items were assigned to two factors, novelty-seeking and, sociability. The items assigned to the novelty-seeking factor included the intensity of expressed joy by the toddler during the novelty-seeking episodes, vigor of approach to the risky novel stimulus, number of times the toddler jumped from the steps onto the mattress and went through the tunnel. The scales included on the novelty-seeking from the TBAQ were Activity Level, Pleasure, Interest, and Anger since these questions pertained to the expression of these behaviors while interacting with novel non-social stimuli.

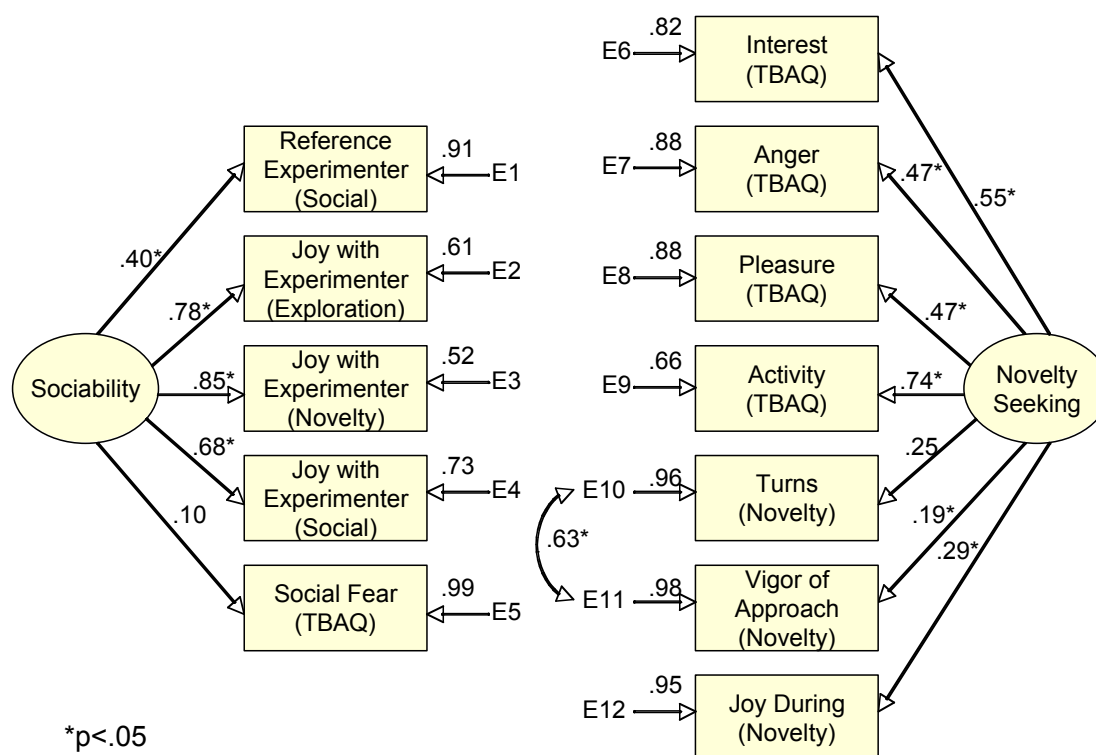
The items assigned to the sociability factor included shared positive emotion with the experimenter in each of the three contexts (e.g. social, exploration, novelty-seeking) and the number of references to the experimenter by the toddler during the social episode. Only the TBAQ Social Fear scale was assigned to the sociability factor since some of the questions from this scale were related to the expression of fear in a social context. It was hypothesized that this item would load negatively on the sociability factor.

Mardia's coefficient was 22.43, indicating excessive kurtosis and thus the need to use robust ML estimation procedures. The fit of the initial model was inadequate (robust RMSEA= .12; SRMR=.14; Satorra-Bentler $\chi^2= 103.51$; $df=54$) so the Lagrange Multiplier test was used to identify error to error covariances that could be added to the model. After the addition of one error to error covariance that was

theoretically justifiable (i.e. the items both reflected motor activity), the model still did not fit well (robust RMSEA= .10; SRMR=.13; Satorra-Bentler $\chi^2= 89.07$; df=53). Figure 6 depicts the item to factor assignment and standardized paths for the initial hypothesized model.

Since the hypothesized model did not fit the data adequately, a less restrictive model in which sociability and novelty-seeking were allowed to covary was also examined. The fit of this model was also inadequate (robust RMSEA= .12; SRMR=.14; Satorra-Bentler $\chi^2= 103.16$; df=53).

Figure 6: Standardized Item Loadings for Two-Factor Model of Exuberance Using Questionnaire and Observational Data



6.4.2 Construct Validity and Reliability of a Two-Factor Model of Exuberance Using Both Questionnaire Items and Behavioral Observation

Since the fit of the model was poor, the reliability and validity of the novelty-seeking and sociability factors were not examined.

6.4.3 Summary

The model employing both TBAQ scales and behavioral observations to index Exuberance fit the data poorly, indicating poor convergence between the caregiver report of temperament via the TBAQ and observed behavioral indices of Exuberance.

6.5 Modeling the Relations between Exuberance, Emotion-Regulation Social Competence and Externalizing Problems

The fifth and final research question pertained to the hypothesized model (Figure 2). To assess this hypothesized structural model, I used the two-step process recommended by Anderson and Gerbing (1988). For the first step, I fit the Measurement Model to the data. For the second step, I applied the hypothesized Structural Model to the data.

6.5.1 Fit of Measurement and Structural Models

The initial Measurement Model was based on the results of Research Questions 1 and 2. Thus, Exuberance was reflected by the two constructs of novelty-seeking and sociability. The item to factor assignments for novelty-seeking and sociability with an unfamiliar adult were identical to those utilized in Research Questions 1 and 2. Thus, the items assigned to the novelty-seeking factor included, (1) the intensity of joy while interacting with the novel risky stimulus, (2) the vigor of

approach to the novel risky stimulus and, (3) the number of turns on the novel apparatus (i.e. times crawled through the tunnel and the number of jumps from the top step). The items assigned to the sociability with an unfamiliar adult factor included (1) the intensity of joy expressed towards the experimenter during the social episodes, (2) the intensity of joy expressed towards the experimenter during the novelty-seeking episodes, (3) the intensity of joy expressed towards the experimenter during the exploration episodes and, (4) the total number of references to the experimenter during the social episodes.

Social competence and externalizing behavior factors were also included in this model. The items assigned to the social competence factor included the following three scales from the ITSEA: (1) imitation/play, (2) empathy, and (3) pro-social peer relations. The items assigned to the externalizing behavior factor included the following three scales from the CBCL: (1) aggression, (2) oppositional defiance problems, and (3) attention deficit hyperactivity problems. Also, the CBCL scale of emotion reactivity (inversely scored) was included in the model as the measure of emotion regulation.

For the Measurement Model, all of the stand alone variables were allowed to covary. The Mardia coefficient of the initial Measurement Model was 23.22 indicating excessive kurtosis. Robust ML estimation procedures were therefore used to ascertain model fit. The initial Measurement Model did not fit the data well (see Table 11). Thus, the Lagrange Multiplier test was used to suggest additional error to error covariance terms that might improve the fit of the model. Error to error covariance terms were only included if there was justification as to why the items

may be related. Based on the LM test and on the fact that the items addressed a similar behavior (i.e. positive emotion) one error to error to covariance was added to the model. The fit of this final Measurement Model was good so the model was retained (Table 11).

For the second step, I specified the paths indicated in the hypothesized Structural Model (see Figure 2) and examined its fit. In the Structural Model, novelty-seeking and sociability were not allowed to covary. The Structural Model fit the data well (see Table 11) thus no further re-specifications were made to it.

Next, the fit of the models were compared. A Satorra-Bentler scaled chi-square difference test with the difference test scaling correction was used for the model comparisons since the data was non-normal and because the models were nested.

First, the fit of the Initial Measurement and Final Measurement Models were compared. The corrected Satorra-Bentler scaled chi-square difference test was not significant ($\chi^2_{diff} = 3.33$, $df_{diff} = 1$, $p > .05$). The non-significant result of the chi-square difference test indicated that neither model fit the data significantly better.

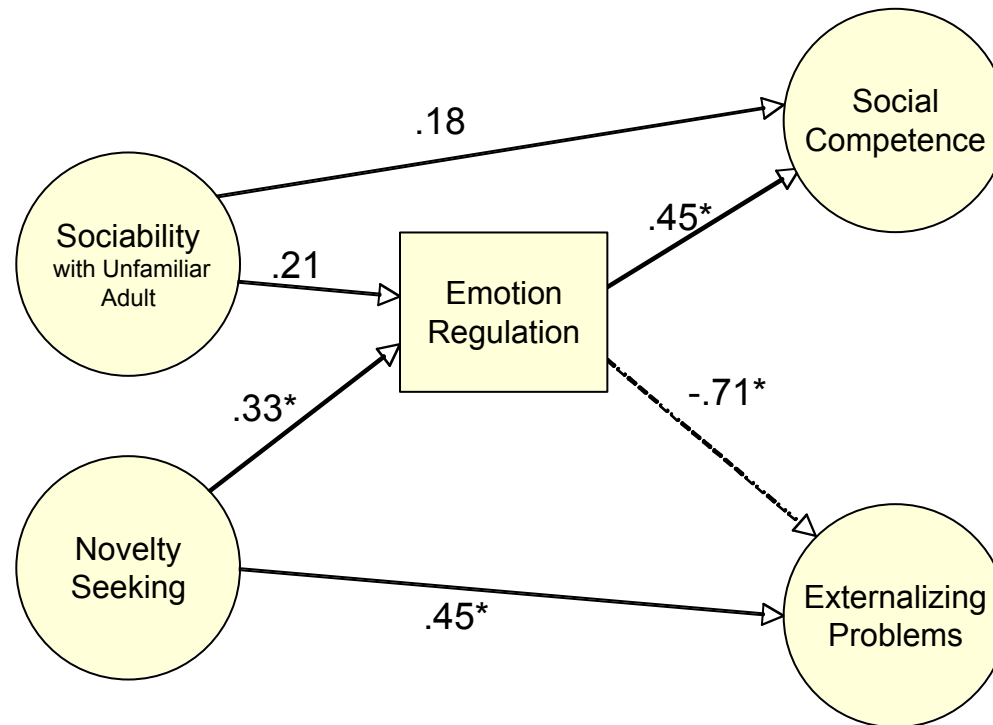
Next, the fit of the Final Measurement and Structural Models were compared via the corrected Satorra-Bentler scaled chi-square difference test (Satorra & Bentler, 1999). The non-significant difference ($\chi^2_{diff} = .07$, $df_{diff} = 2$, $p > .05$) between the two models indicated that both models were plausible. However, since the Structural Model was more parsimonious, additional support for the plausibility of this model was provided.

Table 11: Summary of Model Fit Statistics for the Proposed Model

Model	Satorra-Bentler χ^2 (χ^2)	df	Robust CFI (CFI)	SRMR	Robust RMSEA (RMSEA)
Initial Measurement Model	90.73 (88.52)	70	.90 (.93)	.08	.07 (.06)
Final Measurement Model	85.02 (82.03)	69	.92 (.95)	.08	.06 (.05)
Structural Model	85.16 (82.15)	71	.93 (.96)	.08	.05 (.05)

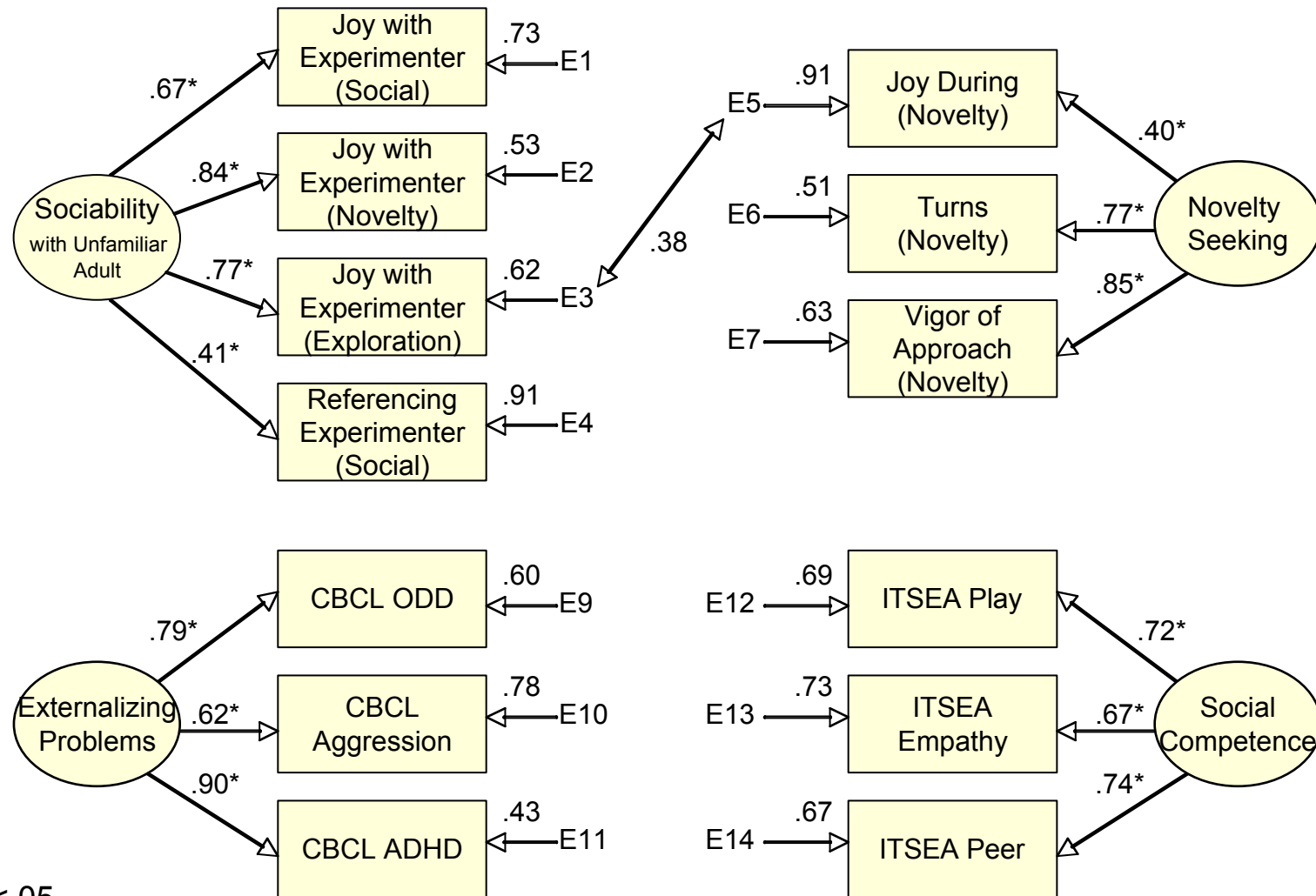
The Structural Model with standardized path coefficients is displayed in Figure 7. Due to the non-normality of the data, robust statistics were used to determine if paths were statistically significant. As seen in Figure 7, some of the predictions about the relations between novelty-seeking, sociability with an unfamiliar adult, emotion regulation, social competence and externalizing behavior were upheld with others were not. The standardized item loadings of factor are displayed in Figure 8.

Figure 7: Standardized Structural Model



*p<.05

Figure 8: Standardized Item Loadings for Factors from the Structural Model



*p < .05

6.5.2 Direct and Indirect Paths in the Structural Model

Emotion regulation was hypothesized to have a direct effect on both social competence and on externalizing problems; however, the path between emotion regulation and social competence was hypothesized to be positive whereas the path between emotion regulation and externalizing problems was hypothesized to be negative.

As hypothesized, these paths were both significant and in the expected direction. That is, there was a negative relation between emotion regulation and externalizing problems and a positive relation between emotion regulation and social competence. These findings were in line with empirical work indicating that good emotion regulation is related to positive socio-emotional outcomes (Eisenberg et al., 1993; Eisenberg, et. al, 1996; Kruger, et. al., 1996; Rubin & Krasnor, 1986) and that low emotion regulation is associated with negative socio-emotional outcomes (Achenbach, 1966; Achenbach, et al., 1987; Carter et al, 2003).

Sociability with an unfamiliar adult was hypothesized to be directly and positively related to social competence. This hypothesis was based on the theorizing of several researchers that sociability promotes positive outcomes (e.g. Denham et al., 1990; Eisenberg et al., 1998; Schaffer, 1966). Thus, the non-significant association between sociability with an unfamiliar adult and later social competence was unexpected.

Sociability with an unfamiliar adult was also hypothesized to impact social competence indirectly. Specifically, emotion regulation was hypothesized to mediate the relation between sociability with an unfamiliar adult and later social competence.

This inclusion of this indirect association in the model was based on studies examining the relations between regulation and adult extraversion (Newman, 1987a; Nicols & Newman, 1986) and on theoretical models of temperament put forward by several theorists (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998). Therefore, this non-significant association was also unexpected.

Novelty-seeking was hypothesized to be directly and positively related to externalizing problems. This hypothesis was largely based on the work of several researchers (Achenbach & Edelbrock, 1983; Cicchetti & Toth, 1991; Oldehinkel et al., 2004; Hirschfeld et al., 1992; Wertlieb et al., 1987) who identified direct relations between strong appetitive behavior and externalizing difficulties. As was hypothesized, a significant positive association between novelty-seeking and externalizing behavior problems was identified thus lending further support to models of Exuberance that suggest that the strong approach and intense positive emotions often associated with this temperamental profile can lead to externalizing problems.

Finally, it was hypothesized that emotion regulation would mediate the relations between novelty-seeking and externalizing problems. These paths were added to the model due to several lines of evidence including work on adult Extraversion (Newman, 1987a; Nicols & Newman, 1986) and the work of a number of theorists (Eisenberg et al., 2000; Fox et al., 2001; Polak-Toste & Gunnar, 2006; Rothbart & Bates, 1998) which point towards the possibility that the relations between Exuberance and later positive *or* negative socio-emotional outcomes may be mediated by emotion regulation skills. The significant paths between novelty-

seeking and emotion regulation and emotion regulation and externalizing problems supported the hypothesis that emotion regulation mediates the relation between novelty-seeking and externalizing problems. Also, the significant paths between novelty-seeking and emotion regulation and emotion regulation and social competence supported the hypothesis that emotion regulation mediates the relation between novelty-seeking and later social competence.

It is also of note that the total effect of the direct and indirect paths from novelty-seeking to externalizing behavior problems approaches zero, indicating that emotion regulation is a dominant mediator.

CHAPTER 7: CONCLUSIONS, LIMITATIONS AND FUTURE DIRECTIONS

7.1 Summary and Conclusions

Based on a review of the temperament, adult personality, and motivation literatures an orthogonal two-factor model of Exuberance was hypothesized. Assessing the factor structure of Exuberance offered the opportunity to replicate aspects of previous studies on this temperamental profile and to contribute to the temperament literature. For instance, this investigation explored the plausibility of four alternative models of Exuberance and examined the factor structure of Sociability. In addition, this study explored the relations between Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult) and behavioral inhibition, in a sample of 2-year olds. The current study also examined the convergence of maternal reports of toddler temperament via the TBAQ questionnaire and behavioral observations of Exuberance. Finally, the current study explored the longitudinal relations between different facets of Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult) and later social and emotional outcomes. In the following sections, the results will be summarized and related to issues pertaining to the study of Exuberance.

7.1.1 Plausibility of a Two-Factor Model of Sociability

The first goal of the current study was to examine the factor structure of Sociability. Although the emergence of several behaviors such as smiling, turn-taking, and imitation have been identified and their impact on social communication and play with peers described, most work examining sociability during infancy and

early toddlerhood has focused on the expression of these behaviors within the caregiver-infant relationship. Given that the overarching goal of the study was to ascertain the core features of Exuberance, it was important to determine whether the Sociability would be best conceptualized as consisting of two interpersonal dimensions, sociability with an unfamiliar adult and quality of attachment, or whether it would be better conceptualized as one general Sociability factor.

Three plausible models of Sociability were therefore examined in the current study. First an orthogonal two-factor model of Sociability was considered. This model would support the work on adult personality which indicates that Extraversion is best conceptualized as consisting of two unique interpersonal dimensions: (1) affiliation, which reflects warmth, affection, and the enjoyment of close interpersonal relationships, and (2) agency, which reflects the experience of attaining social dominance or leadership (Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005). Applying this model to Sociability would suggest that the tendency to express sociable behaviors towards familiar versus unfamiliar others may represent two distinct interpersonal dimensions of Exuberance. An orthogonal two-factor model would also replicate the exploratory factor analysis of IBQ data conducted by Garstein and Rothbart (2003) which yielded a factor structure in which the affiliation scale item did not load significantly onto the surgency factor but loaded significantly onto the orienting/emotion regulation factor (Garstein & Rothbart, 2003). The loading of the affiliation scale onto the orienting/emotion regulation factor suggests that affiliation is associated with comfort and calm contentment rather than with intense positive emotion and the tendency to approach novel people or stimuli. Finally, an

orthogonal two-factor model of Sociability would support the notion that the emergence of quality of attachment behaviors and sociability with unfamiliar others arise from different neurobiological systems; namely that oxytocin and vasopressin modulates the former but not the later behavior (Depue & Collins, 1999).

An oblique two-factor model of Sociability was also examined. A strong relation between these two factors would lend support to the potential influence of a common neuro-circuitry (i.e. hippocampus, oxytocin, and vasopressin) on the expression of Sociability towards familiar and unfamiliar others.

A one-factor model of Sociability, in which all of the sociability and quality of attachment items were assigned to one general Sociability factor was also considered. This model would also suggest that the activation of one system, likely the neuro-circuitry associated with social bonding, would influence the expression of *all* types of sociability.

As hypothesized an orthogonal two-factor model of Sociability best fit the data. The plausibility of this model lends support to the notion that the tendency to be sociable with *familiar* others may be distinct from the tendency to be sociable with *unfamiliar* others. An orthogonal two-factor model of Sociability is in line with the work on adult personality which has pointed towards the possibility that Extraversion is best characterized by at least two interpersonal factors, affiliation and agency (e.g. Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005). Also, the plausibility of an orthogonal two-factor model of Sociability supports the work of Rothbart and her colleagues (Garstein & Rothbart, 2003) on infant temperament in which exploratory factor analysis of IBQ data yielded a factor structure of surgency in

which the affiliation item did not load onto the surgency factor. Finally, the plausibility of an orthogonal two-factor model of Sociability lends support to the notion that individual differences in the tendency to prefer close personal bonds versus interaction with novel social partners may be partially attributable to the fact that that affiliatory or attachment behaviors are impacted by oxytocin and vasopressin whereas agentic behaviors or sociability are not (Depue & Collins, 1999; Depue & Morrone-Strupinsky, 2005).

The four factor loadings from the sociability with unfamiliar adult factor were all significant. The significant factor loadings of each of the four items supports work emphasizing the centrality of behaviors such as joint attention (e.g. Bakeman & Adamson, 1984), smiling (e.g. Schaffer, 1966) and, social referencing (e.g. Hornick & Gunnar, 1988) in sociability. The variance extracted from the sociability with unfamiliar adult factor was adequate indicating that the items used to index the factor were good indicators of it. The reliability of this factor was also satisfactory, indicating that it would likely show stability and replicability. Therefore, the items representing expressed positive emotion towards the experimenter across contexts and referencing the experimenter during the social episode appeared to be good indices of sociability that should be utilized in future assessments of Exuberance in toddlers.

Three of the four factor loadings of the quality of attachment to the caregiver factor were significant. The items representing expressed positive emotion towards the caregiver during the exploration and novelty-seeking episodes and referencing the caregiver during all of the episodes loaded significantly onto the quality of attachment

to the caregiver, indicating significant correlations between these three items and the quality of attachment to the caregiver. The significant factor loadings of these three items supports work which emphasize the centrality of behaviors such as joint attention (e.g. Bakeman & Adamson, 1984), smiling (e.g. Schaffer, 1966), and social referencing (e.g. Hornick & Gunnar, 1988) in the quality of attachment to the caregiver.

One item, the expression of positive emotion towards the caregiver, did not load significantly onto the quality of attachment to the caregiver factor. One possible reason that this item may not have been correlated with the quality of attachment to the caregiver factor is because it involved the toddler playing one-on-one with the experimenter. Playing with the experimenter one-on-one may have garnered much of the toddler's attention thereby making it less likely that the toddler would share positive affect with the caregiver while simultaneously engaging with the experimenter in play.

Despite the fact that the plausibility of an orthogonal two-factor model was supported by the data, this finding must be interpreted with caution since the construct validity of the quality of attachment to the caregiver factor was quite low. One reason for the poor validity of this factor may be due to the instructions given to caregivers at the beginning of the visit to interact with their toddler as little as possible. Although this instruction is typically given to caregivers at the beginning of many behavioral assessments of temperament in order to facilitate toddler participation (e.g. Kagan et al., 1995; Fox, Henderson, Rubin et al., 2001), in this case it may have resulted in caregivers responding to their toddler in ways that they

normally would not and this may have inadvertently influenced the toddler's behavior.

7.1.2 Plausibility of a Two-Factor Model of Exuberance

Several different conceptualizations of Exuberance have been put forward extant temperament literature. Exuberance has been characterized as reflecting: (1) the tendency to display high sociability, lack of fear and high approach in response to novelty (Fox, Henderson, Rubin et al., 2001; Pfeiffer et. al., 2002); (2) the tendency to respond to novelty with approach behaviors and positive emotion and to respond with frustration to a blocked goal and, (3) individual differences in sociability but not positive emotion (e.g. Buss & Plomin, 1975; 1984).

Work on adult Extraversion has also pointed towards two additional models that may be used to conceptualize Exuberance. For example, a model of positive emotion put forward by Tellegen (1985), which conceptualizes adult Extraversion as reflecting the trait positive emotionality rather than other facets of the trait Extraversion (e.g. reward-sensitivity, activity), may also be a way in which to frame Exuberance in infancy and toddlerhood. Under Tellegen's (1985) model, Exuberance would reflect individual differences in the tendency to display positive emotion.

A second model from the Extraversion literature that can be utilized to elaborate current frameworks of Exuberance in infancy and toddlerhood are models of reward-seeking and motivation. Under a reward-seeking model, Exuberance can be viewed as arising from lower thresholds for or greater sensitivity to "reinforcing" or "high incentive saliency" cues. Therefore, similar to adult Extraversion, toddler

Exuberance could be viewed as reflecting approach behavior, positive affect, and greater sensitivity to reward.

Since there were several frameworks with different core features that could be used to conceptualize Exuberance, the second goal of the current study was to ascertain the factor structure of Exuberance. Based on the extant literature, the plausibility of four factor models was examined. First the plausibility of an orthogonal two-factor model of novelty-seeking and sociability with an unfamiliar adult was considered. An orthogonal two-factor model would lend support to the models of Exuberance put forward by Fox, Henderson, Rubin et al. (2001) and Pfeiffer et al. (2002) since both models identify sociability and novelty-seeking as the core components of this temperamental profile. An orthogonal two-factor model of Exuberance would also lend support to the model of sociability advanced by Buss and Plomin (1984) since their EAS model of temperament highlights the distinctiveness of sociability from all other dimensions of temperament. Finally, an orthogonal two-factor model of Exuberance would lend further support for the notion that there are individual differences in the sensitivity towards novel social and non-social cues (Depue & Collins, 1999).

The second model that was considered was an oblique two-factor model of Exuberance. An oblique two-factor model would support to the model of Exuberance put forward by Rothbart et al. (2001) in which the expression of positive emotion and approach behavior towards social and non-social classes of stimuli are not differentiated.

Third, the plausibility of a one-factor model of general positive emotion was examined. Tellegen's (1985) model of adult Extraversion would prove applicable to Exuberance in toddlerhood if a one-factor model of positive emotion would best fit the data. Under this model, Exuberance would reflect the tendency to express positive emotion *across* contexts (i.e. to both social and non-social stimuli).

Finally, the plausibility of a one-factor model of general approach motivation/reward-seeking was considered. Support for the application of the BAS (Gray, 1970; 1971; 1982; 1987) and/or the BFS (Depue & Collins, 1999) models of approach motivation to Exuberance would be provided if this one-factor model best fit the data.

As hypothesized, an orthogonal two-factor model, reflecting novelty-seeking and sociability with an unfamiliar adult, of Exuberance best fit the data. The plausibility of this model supports the conceptualizations of Exuberance put forward by Fox, Henderson, Rubin et al. (2001) and Pfeiffer et al. (2002), and the model of Sociability put forward by Buss and Plomin (1975; 1984). Furthermore, the orthogonal two-factor model of Exuberance highlights the necessity of indexing the expression of approach and positive emotion to non-social and social stimuli separately.

The factor loadings of the three novelty-seeking items were all significant, indicating significant correlations between these items and the novelty-seeking factor. The utility of these behaviors in the assessment of novelty-seeking is in line with models of Exuberance put forward by Fox, Henderson, Rubin et al. (2001), Pfeiffer et al. (2002), and Rothbart et al. (2001) which have each identified these behaviors as

reflecting Exuberance. The variance extracted from the novelty-seeking factor was adequate indicating that the items used to index the factor were good indicators of it. The reliability of the novelty-seeking factor was also satisfactory, indicating that the factor would likely show stability and replicability. Taken together, the vigor of approach towards a novel risky stimulus, the number of turns taken on the risky apparatuses and the intensity of expressed positive emotion during play on the novel risky apparatuses appeared to be good indices of novelty-seeking that can be utilized in future assessments of novelty-seeking toddlers.

7.1.3 Relations between Exuberance and Behavioral Inhibition

Since a number of studies have utilized indices of low behavioral inhibition to measure Exuberance (e.g. Fox, Henderson, Rubin et al., 2001; Pfeiffer et al., 2002), the third goal of the current study was to examine the relations between Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult) and behavioral inhibition when the unique concomitants of Exuberance were assessed.

Based on two lines of evidence, an orthogonal three-factor model of temperament was hypothesized. First, there is evidence to suggest that novelty-seeking and sociability with an unfamiliar adult have different neuroanatomical and neurotransmitter underpinnings than behavioral inhibition. More specifically, novelty-seeking behavior and sociability with an unfamiliar adult are hypothesized to arise from activation of the reward system and the release of mesolimbic DA while behavior inhibition has been associated with activation of the central nucleus of the amygdala, anterior and medial hypothalamus, paraventricular grey and the nucleus reticularis pontis caudalis and the release of neurotransmitters such as CRF and

ACTH (Depue & Collins, 1999; LeDoux, 1996). Also, a number of studies have reported that constructs similar to novelty-seeking, sociability, and behavioral inhibition were unrelated. For example, a study by Cheek and Buss (1981) reported no association between the dimensions of shyness and sociability and, a factor analysis of child temperament conducted by Rothbart and her colleagues (Rothbart et al., 2001) found no relations between the surgency factor and the negative emotionality factor.

Although an orthogonal three-factor model (i.e. sociability with an unfamiliar adult, novelty-seeking and behavioral inhibition) was hypothesized, this model did not adequately fit the data. As a result, a less restrictive model in which all of the three factors were allowed to covary was considered. The oblique three-factor model fit the data adequately. The plausibility of this model lent support for the notion that novelty-seeking and sociability were distinct from behavioral inhibition even if two of the factors, namely novelty-seeking and behavioral inhibition, were significantly related to one another.

Since behavioral inhibition and novelty-seeking were significantly negatively correlated with one another, two additional plausible models of temperament were also considered. First, the fit of a two-factor model of temperament (i.e. sociability with an unfamiliar adult, novelty-seeking/behavioral inhibition) was examined. Second, a three-factor model (i.e. sociability with an unfamiliar adult, novelty-seeking and behavioral inhibition) in which *only* the behavioral inhibition and novelty-seeking factors were allowed to covary with one another was also examined. Since the three-factor model of temperament in which only the behavioral inhibition

and novelty-seeking factors were allowed to covary best fit the data, additional support for the distinctiveness of the two Exuberance factors (i.e. novelty-seeking and sociability with an unfamiliar adult) from behavioral inhibition was provided.

Although support for the distinctiveness of Exuberance (i.e. sociability with an unfamiliar adult and novelty-seeking) from behavioral inhibition was provided by the three factor model in which the behavioral inhibition and novelty-seeking factors were allowed to covary, the significant negative correlation between them indicated that these two constructs were related to one another. One possible reason for the strong association between novelty-seeking and behavioral inhibition may be due to the underlying neuro-biological mechanisms associated with each of these behavioral phenotypes. That is, novelty-seeking and behavioral inhibition may be negatively related due to the mutual inhibition of the reward and fear systems on each other (Gray, 1987; Newman, 1987a, 1987b). It is possible that novelty-seeking is the result of a strongly activated reward system and a weakly activated fear system and that behavioral inhibition is the result of a weakly activated fear system and a strongly activated fear system.

Despite the fact that the plausibility of a three-factor model of temperament, in which the behavioral inhibition and novelty-seeking factors were allowed to covary was supported by the data, the utility of this model must be interpreted with caution. This is due to the fact that the construct validity of the behavioral inhibition factor was quite poor. More specifically only two of the three factor loadings for the behavioral inhibition construct were significant. The items representing duration of proximity to mom and latency to touch the novel stimulus during the exploration

episodes loaded significantly onto the behavioral inhibition factor, indicating significant correlations between these two items and the behavioral inhibition factor. The significant factor loadings of these two items support the work on behavioral inhibition (Asendorpf, 1994; Fox et al., 2001; Kagan, 1994; Kagan et al., 1989; 1995) that have highlighted their association with this temperamental profile. One item, the latency to vocalize, did not load significantly onto the behavioral inhibition factor. This was particularly surprising since these items were regularly reported in the extant literature as indices of behavioral inhibition (e.g. Fox, Henderson, Rubin et al., 2001; Kagan et al., 1995).

The low construct validity of the behavioral inhibition factor suggests that different behaviors are needed to assess this temperamental profile. In particular, latency to vocalize did not appear to be a good index of behavioral inhibition. One reason that current measures of behavioral inhibition are inadequate may be due to the fact that they do not contain any indices of affect. Therefore, one way to improve current indices of behavioral inhibition may be to include indices of emotion such as expressed fear.

7.1.4 Convergence of Questionnaire and Behavioral Measures

The fourth goal of the current study was to examine the convergence of questionnaire and behavioral measures of Exuberance. Since the TBAQ questionnaire is the most commonly administered assessment of temperament in toddlerhood, the relation between the TBAQ items and behavioral observations of Exuberance were examined.

It was hypothesized that because four (i.e. activity level, positive affect interest and anger) of the five TBAQ scale items were questions largely pertaining to novel stimuli that these items would load onto the novelty-seeking factor and that the fifth TBAQ scale, social fear, would load negatively onto the sociability factor. The poor fit of both the hypothesized orthogonal two-factor model and the less restrictive oblique two-factor model indicated that there was little convergence between questionnaire and behavioral assessments of Exuberance.

One possible explanation for the lack of convergence between behavioral and questionnaire assessments of Exuberance may be due to the fact that observed behaviors were context specific whereas the items from the TBAQ were not. For example, indices of the tendency to display pleasure during play with novel toys and during interaction with family members were all aggregated into one TBAQ pleasure scale while behavioral observations of positive emotion in response to the caregiver, experimenter and, to play on a risky apparatus were not aggregated. Also, expressions of social fear with familiar and unfamiliar peers, and to familiar and unfamiliar adults, were aggregated to create a single TBAQ social fear scale whereas behavioral observations of sociability towards the experimenter and the caregiver were not aggregated.

Another possibility is that maternal reports of temperament are not highly related to experimenter assessments of temperament. Recent work by Leerkes and Crockenberg (2003) indicates that maternal characteristics such as degree of sensitivity, emotional neediness and prenatal depressive symptoms can moderate the concordance between maternal reports and laboratory observations of temperament.

Since both an orthogonal and the less restrictive oblique two-factor models of Exuberance fit the data poorly there is no evidence to suggest convergence between caregiver report and behavioral assessments of Exuberance.

7.1.5 Relations between Exuberance, Emotion Regulation, Social Competence and Externalizing Problems

A review of the extant literature on Exuberance indicates that this temperamental profile has been associated with both positive (Denham et al., 1990; Eisenberg et al., 1998; Schaffer, 1966) and negative outcomes (Achenbach & Edelbrock, 1983; Cicchetti & Toth, 1991; Oldehinkel, et al., 2004; Hirschfeld et al., 1992; Wertlieb, et al., 1987). One reason that this temperamental profile may be associated with both positive and negative outcomes may be due to the fact that different facets of it are more highly associated with either positive or negative outcomes. Data suggest that sociability may be more highly associated with positive outcomes (Denham et al., 1990; Eisenberg et al., 1998) and that novelty-seeking behaviors may be more strongly associated with negative outcomes (Hirschfeld et al., 1992). Several researchers have also raised the possibility that Exuberance may lead to externalizing difficulties if the child has poor regulatory capacities (Fox, Henderson, Rubin et al., 2001; Rothbart et al., 2000). That is, regulation may mediate the relations between Exuberance and positive or negative socio-emotional outcomes. Therefore, the fifth and final goal of the current study was to examine the relations between specific facets of Exuberance (i.e. sociability with an unfamiliar adult and novelty-seeking) with respect to later emotion regulation, social competence, and externalizing problems.

Overall, the results of the current investigation supported the proposed model. The proposed model highlighted the importance of emotion regulation in mediating the relations between Exuberance later socio-emotional outcomes as well as examining the unique facets of Exuberance (i.e. novelty-seeking and sociability with an unfamiliar adult) separately since they appear to be related to emotion regulation and positive and negative outcomes in different ways. As hypothesized, emotion regulation mediated the relation between novelty-seeking and later socio-emotional outcomes. Externalizing problems were predicted by novelty-seeking. It is also of note that the total effect of the direct and indirect paths from novelty-seeking to externalizing behavior problems approached zero, indicating that emotion regulation was a dominant mediator variable.

There were, however, some unexpected findings. In particular, emotion regulation was not found to mediate the relations between sociability and later socio-emotional development. One possible explanation for this non-significant association may be that sociability is reflected by less intense feelings of positive emotion and approach motivation than novelty-seeking. As a result, emotion regulation skills may be less important in mediating the relations between sociability and later socio-emotional outcomes. Alternatively, other types of regulation, such as those pertaining to executive inhibition (i.e. delay of gratification, attention), may play a more important role in mediating the relations between sociability and later socio-emotional development. This possibility should be examined in future work.

7.2 Limitations

Although the current study addressed a major methodological gap in the temperament literature by identifying the core behaviors associated with Exuberance, the study was limited in certain respects. After collecting and analyzing the data, it became apparent that the behavioral inhibition and quality of attachment to the caregiver factors had less than ideal validity. This was not anticipated and may have affected the accuracy of associations identified between these factors and the other factors in their respective models.

In terms of the quality of attachment to the caregiver factor, caregivers were asked to interact with their toddler as little as possible during the tasks. The lack of responsivity by their caregiver may have impacted the toddler's behavioral responses to their caregiver. In the future, the caregiver should be directed to respond to their toddler as they normally would so that interaction between toddler and caregiver is more naturalistic.

The validity of the behavioral inhibition factor was also inadequate, which was unexpected since the behaviors used to index it have been utilized previously (Fox et al., 2001; Kagan et al., 1995). The low construct validity of the behavioral inhibition factor suggests that different behaviors are needed to assess this temperamental profile. In particular, latency to vocalize did not appear to be a good index of behavioral inhibition. One reason that current measures of behavioral inhibition are inadequate may be due to the fact that they do not contain any indices of affect. Therefore, one way to improve current indices of behavioral inhibition may be to include indices of emotion such as expressed fear.

7.3 Implications for Future Research

Despite these limitations, the findings from the current investigation have implications for future research. The identification of a two-factor model of Exuberance and a two-factor model of Sociability may have significant implications for future research.

First, conceptualizations of behavioral inhibition and Sociability need to be elaborated. For example, although the items assigned to the behavioral inhibition factor were based on previous work, the validity of this factor was less than ideal. A lack of specificity is one possible reason for the less than ideal validity of the behavioral inhibition factor. That is, the factor was largely based on very general behaviors (i.e. latency to approach a novel non-social stimulus) rather than on specific behaviors related to the fear system, such as intensity of expressed facial fear and startle. Also, closer inspection of the behavior inhibition factor items indicated that the latency to vocalize item did not relate well to the other items in the factor. It maybe the case that vocalization may be a better index of Sociability rather than behavioral inhibition.

Second, measurement development of Sociability is needed. To date, most of the work on Sociability during the first few years of life focuses on the dyadic relationship between the primary caregiver with little attention being paid to the nature of Sociability with familiar and unfamiliar peers until early childhood. Data from the current study indicates that by 2-years of age, differences in sociability with and unfamiliar adult and quality of attachment to the caregiver can be indexed. Again,

the elaboration of Sociability after the first year of life with a variety of social partners needs to be examined empirically.

Third, the factor structure of Sociability and Exuberance needs to be replicated in order to ascertain the generalizability of these findings to different samples and to different ages. In addition, longitudinal investigations of the continuity and discontinuity of Exuberance may help identify the impact of this temperamental profile on social and emotion adjustment and/or maladjustment.

Finally, as noted above, the constructs included in the proposed structural model were not comprehensive. Instead, the model only represented an initial step towards explicating how various facets of Exuberance (i.e. novelty-seeking and sociability with an unfamiliar social partner) and emotion regulation impacted later social competence and/or externalizing problems. Potentially, future works can expand on this model to include other aspects of Sociability (i.e. familiar and unfamiliar peers), regulation (i.e. executive inhibitory process) or examine other types of outcomes (i.e. mastery motivation) that may be related to Exuberance.

Also, the current study examined the longitudinal relations between Exuberance and later social and emotional development. Whether or not these relations show stability over the course of development would also be important to ascertain so that factors, whether endogenous or exogenous to the child, that maintain positive or negative social and emotional outcomes can be explicated.

TABLES

Table 1: Scale Definitions (IBQ-R)

Activity Level	Gross motor activity, including movement of arms and legs, squirming and locomotor activity. (“When put into the bath, how often did the baby splash or kick?”)
Approach	Rapid Approach, excitement, and positive anticipation of pleasurable activities. (When given a new toy, how often did the baby get very excited about getting it?)
Cuddliness	Expression of enjoyment and molding of the body to being held by a caregiver. (“When rocked or hugged, during the last week, how often did the baby seem to enjoy him/herself?”)
High Intensity Pleasure	Pleasure or enjoyment to high stimulus intensity, rate, complexity, novelty, and incongruity. (“During a peek-a-boo game how often did the baby smile?”)
Perceptual Sensitivity	Detection of slight, low intensity stimuli from the external environment. (“How often did the baby notice fabrics with scratchy texture (e.g. wool)?”)
Smile and Laughter	Smiling or laughter during general caretaking and play. (“How often during the last week did the baby smile or laugh when given a toy?”)
Vocal Reactivity	Amount of vocalizations exhibited by the baby in daily activities. (“When being dressed and undressed during the last week, how often did the baby coo or vocalize?”)

Table 2: Scale Definitions (CBQ)

Activity Level	Gross motor activity, including rate and extent of locomotion. (“Seems always in a big hurry to get from one place to another.”)
High Intensity Pleasure	Pleasure or enjoyment to high stimulus intensity, rate, complexity, novelty, and incongruity. (“Likes going down high slides or other adventurous activities.”)
Impulsivity	Speed of response initiation. (“Usually rushes into an activity without thinking about it.”)
Positive Anticipation	Amount of excitement and anticipation for expected pleasurable activities. (“Gets so worked up before an exciting event that s(he) has trouble sitting still.”)
Shyness (versus Social Approach)	Slow inhibited (versus rapid) speed of approach and discomfort (versus comfort) in social situations. (Often prefers to watch rather than join other children playing.”)
Smile and Laughter	Positive emotion in response to changes in stimulus intensity, rate, complexity, and incongruity. (“Laughs a lot at jokes and silly happenings.”)

Table 3: Items from the Social Orientation Scale (IBR)

Social Orientation Scale	Rating
<i>Responsiveness to persons</i>	1 - Behavior towards person is not different from behavior towards objects 2 - Between 1 and 3 3 - Responds briefly to social approach but when not approached directly by persons does not attend to them 4 - Between 3 and 5 5 - Responds to social approach and persons present, but less than half the time 6 - Between 5 and 7 7 - Responds to social approach and continues to interest in persons present 8 - Between 7 and 9 9 - Behavior seems to be continuously affected by awareness of persons present
<i>Responsiveness to examiner</i>	1 – avoiding or withdrawn 2 – hesitant 3 – accepting 4 – friendly 5 – inviting (initiating, demanding)
<i>Responsiveness to mother</i>	1 – avoiding or withdrawn 2 – hesitant 3 – accepting 4 – friendly 5 – inviting (initiating, demanding)

Table 4: Items from the Sociability Scale (CCTI)

Child makes friends easily.

Child is very friendly with strangers.

Child is very sociable.

Child takes a long time to warm-up to strangers. (reversed)

Child tends to be shy. (reversed)

Table 5: Outline of the Coding Scheme Used in the Current Study

Behavior	Coding
Intensity of Jump	The intensity of the first jump from the top of the steps onto the mattress. 0=none, 1=low, 2=high.
Risk-Taking	Sum of the frequency of jumps from top step onto mattress and times crawled through the tunnel.
Vigor of play with 'risky' stimulus.	Intensity of motor activity during play with risky stimulus. 0=none, 1=low, 2=moderate, 3=high
Intensity of joy during novelty-seeking	Intensity of positive emotion during novelty-seeking. 0=none, 1=low, 2=moderate, 3=high
Number of Visual References to Experimenter	Total number of visual references to the experimenter.
Intensity of joy during interaction with Experimenter	Intensity of positive emotion expressed towards the experimenter. 0=none, 1=low, 2=moderate, 3=high
Intensity of joy during interaction with Mom	Intensity of positive emotion expressed towards mom. 0=none, 1=low, 2=moderate, 3=high
Number of Visual References to Mom	Total number of references to mom.
Proximity to mom	Duration (in seconds) of being in contact with mother.
Latency to touch	Duration (in seconds) to touch stimulus.
Latency to 3rd vocalization	Duration (in seconds) to third vocalization.

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