INDIVIDUAL DIFFERENCES AND ADOLESCENT PSYCHOSOCIAL DEVELOPMENT

by

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DEDICATION

This project is dedicated to my family, without whom my education would still be nothing more than a distant dream.

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CHAPTER I

INTRODUCTION

Adolescence has long been characterized as a time of heightened emotional reactivity and poor self-control. In 1904, G. Stanley Hall characterized adolescence as a period of "storm and stress," typified by questioning and contradiction of parents, mood disruptions, and reckless behaviors. He posited that this period originated in "the chemistry" of adolescence, and represented an evolutionarily preserved "memory" of an earlier period of difficulty in human evolution. The psychoanalytic viewpoint, such as that expressed by Anna Freud, saw adolescent storm and stress as a biologically driven reawakening of the Oedipal conflicts of early childhood. This resurgence of instinctive drives was seen to lead to emotional volatility, depression, and antisocial behavior (Freud, 1968, as cited in Arnett, 1999).

Not all researchers have agreed with the "storm and stress" model of adolescent development. For example, Margaret Mead's (1928) anthropological studies supported the idea that storm and stress may be culturally driven; her work described non-Western cultures in which adolescents did not seem to experience emotional disruption. Further, several studies in the late 60s and early 70s found that 75% of teenagers had positive relationships with their families (see Steinberg, 2001, for a review). In addition, Rutter

and colleagues (Rutter, Graham, Chadwick, & Yule, 1976) showed that many of the remaining 25% had familial problems prior to the child's entry into adolescence. Many researchers subsequently dismissed "storm and stress" models of adolescence, focusing on adolescence as a normative period of development rather than a period of difficulty for adolescents and their families.

While researchers may have dismissed the notion that adolescence is an inherently challenging period of development, parents, and educators seem to have retained it. Studies by Buchanan and Holmbeck (1998), among others, have found that the general public, including college students, teachers, and parents of adolescents, view early adolescence as a period of strife. Indeed, empirical evidence also suggests general increases in negative affect (Buchanan, Eccles, & Becker, 1992), sensation seeking and risk taking behaviors (Arnett, 1999), conflict with parents (Steinberg, 2001), and restlessness, mood swings, and anxiety during the period of adolescence (Buchanan et al., 1992). These findings have led to a modified storm and stress theory, in which it is suggested that adolescence is "the period when 'storm and stress' is more likely to occur than at other ages" (Arnett, 1999, p. 317). However, important individual differences exist in the extent to which a given adolescent will exhibit storm and stress (Arnett, 1999).

The goal of the current set of studies is to examine the contribution of individual differences to adolescent aggression, depressive mood, and pro- and anti-social behaviors. The variables examined include temperament and pubertal maturation during early adolescence, and temperament and executive attention, in conjunction with parenting variables, in later adolescence. This approach allows examination of multiple

sources of influence concurrently, and may contribute to our understanding of factors that predict those individuals most likely to experience mood disturbances and behavioral difficulties during the adolescent period.

Temperament, Attention, and Puberty as Individual Differences

One important source of individual differences during adolescence is temperamental emotional reactivity and self-regulation. We can think of emotional reactivity as encompassing the "onset, duration, and intensity of expression of affective reactions (e.g., fear, anger, positive affect), as well as variability in arousability and distress to overstimulation, activity, and attention" (Rothbart & Bates, 1998, p.108). Emotional reactivity is thought to arise from evolutionarily conserved affective-motivational systems in the brain. Individual differences in emotional reactivity can be seen, then, as resulting from individual differences in the neural structures and neurochemistry subserving such systems (Rothbart & Bates, 1998).

When we speak of self-regulation, we refer to the capacity for effortful control of action and emotion. Effortful control involves the modulation of reactive behaviors, and the ability to flexibly orient attention from one focus to another. Indeed, we view effortful control as reflecting functioning of a neurally based executive attention system that allows an individual to choose between competing response tendencies and, when necessary, to suppress an inappropriate response. When older children are low in effortful control, their activities may continue to be driven by more reactive aspects of temperament, including response to reward and punishment cues in the environment (Rothbart & Bates, 1998). If adolescence is inherently a time of greater than usual

reactivity, as suggested by Hall and others, then we may see increases in reactivity as being particularly difficult to manage for adolescents low in effortful control. Indeed, poor self-regulation has been implicated as a risk factor in a number of studies of adolescent emotional dysregulation and problem behaviors (e.g., Caspi, Henry, McGee, Moffitt, & Silva, 1995; Dahl, 2001; White, Moffitt, Caspi, Jeglum-Bartusch, & Stouthamer-Loeber, 1994; Wills, Cleary et al., 2001)

A number of approaches have been used to assess temperament in toddlers and children, including parent- and teacher-report, naturalistic observations, and laboratory procedures designed to elicit particular behaviors (see Rothbart & Bates, 1998, for a discussion). Adolescent temperament is often assessed via parent-, teacher-, and/or self-report. Relatively fewer observational and laboratory studies of temperament have been conducted with adolescents, although a number of studies have used neuropsychological testing batteries to assess purported functioning of frontal areas of the brain (e.g., Giancola, 2000; Giancola, Mezzich, & Tarter, 1998; Giancola & Tarter, 1998; Moffitt, 1993). In general, poor performance on these tasks has been related to anti-social behaviors. We view functioning of frontal areas as vital to self-regulation; thus, these findings are in keeping with our theoretical model. In addition, Krueger, Caspi, Moffitt, White, and Stouthamer-Loeber (1996) used a delay of gratification laboratory paradigm to assess self-control in 12- and 13-year-old males. Poor delay of gratification was related to externalizing problems; again, this finding is consistent with our model of self-regulation.

Another potentially important source of individuality during adolescence is pubertal maturation. While puberty is not traditionally considered an individual

difference variable, adolescents vary widely in the onset of, and progression through, puberty. In any 7th-grade classroom, one may see individuals who are not yet showing any signs of pubertal development, while others appear to have completed physical maturation. At any given point in time over a span of several years, pubertal maturation differs from adolescent to adolescent. Pubertal maturation involves not only outwardly visible morphologic changes, but changes in internal neuroendocrine and CNS activity (Plant, 2001; Terasawa & Fernandez, 2001), making it a potentially powerful source of individuality during adolescence.

The current set of studies focuses on the role of temperament, executive attention, and puberty in psychosocial outcomes in adolescence. Relationships between temperament and puberty are also examined in early adolescence, and relationships between temperament and executive attention in later adolescence. In addition, individual differences are examined within the context of environmental variables. In this introduction, a review of the current literature on methods for assessing puberty, individual differences in emotional reactivity, self-regulation, attention, and pubertal processes is presented within the framework of adolescent psychosocial development. This is followed by a brief summary of studies done in our laboratory and in others that have contributed to the methodology and theoretical framework employed in the current studies. Finally, specific hypotheses and expectations are reviewed.

Assessing Puberty

A number of methodological approaches have been developed to study the role of puberty in adolescent psychosocial development. The most direct method involves the

measurement of pubertal hormones (androgens and estrogens), and is based on the assumption that levels of these hormones are directly linked to behavior. Overall levels of pubertal hormones are examined via blood, urine, or saliva samples (Brooks-Gunn, Graber, & Paikoff, 1994). Researchers then look for linear relationships between hormone levels and the behaviors of interest, typically aggression, or depressive mood.

Several methodological difficulties are associated with this line of inquiry. During puberty, the hypothalamus releases gonadotropin-releasing hormone, which stimulates the pituitary gland to release luteinizing hormone (LH) and follicle stimulating hormone (FSH). LH and FSH then stimulate the release of gonadal hormones. The hypothalamic release of gonadotropic releasing hormone occurs in pulses. These pulses happen primarily during sleep in the early stages of puberty, then eventually occur throughout the day (Plant, 2001; Terasawa & Fernandez, 2001). This pulsing action makes accurate measurement of hormone levels in early puberty difficult. Levels of gonadotropic releasing hormone, LH and FSH, as well as androgens and estrogens, rise and fall during the day. Individual differences in the number and timing of pulses occurring during a 24-hour period vary widely. It is not known how quickly a pulse of gonadotropic-releasing hormone results in an increase in gonadal hormones (Angold, Costello, Erkanli, & Worthman, 1999).

Other methods to measure pubertal development are far less complex than direct measurement of hormone levels. These methods usually involve assessment of secondary sexual characteristics as a marker of pubertal development. In 1969, Marshall and Tanner (as cited in Graber, Petersen, & Brooks-Gunn, 1996) assembled photographs of adolescents at various levels of pubertal development. These photographs showed the

progress of breast and pubic hair growth in females, and genital and pubic hair growth in males. While puberty does not involve clearly demarcated "stages," Marshall and Tanner grouped photographs to represent five general levels of development: pre-pubertal, early-pubertal, mid-pubertal, late-pubertal, and post-pubertal. Physicians could then compare patients to the Tanner photographs to determine the level of pubertal development.

These pictures have been the standard for many years in assessing pubertal status, and they have also been converted to drawings for use with self-assessment in children, as have questionnaires that ask children about their physical development (e.g., the Pubertal Development Scale, (Petersen, Crockett, & Richards, 1988). These methods yield a puberty status score that can then be converted to a stage score matching the five levels of pubertal development outlined by Marshall and Tanner (as cited in Graber, Petersen, & Brooks-Gunn, 1996). These pubertal status scores and stage rankings are often used in studies of pubertal maturation and behavior.

Pubertal stage measures may be used in one of two ways. The first assumes that the outward effects of pubertal hormones (e.g., the development of secondary sexual characteristics) are linked to the internal effects of pubertal hormones (e.g., neuroendocrine and CNS changes). Thus, the development of secondary sexual characteristics serves as a proxy measure of underlying hormonal activity. Correlations between Tanner stages and gonadal hormone levels range from .60 - .80 (Graber et al., 1996), indicating that secondary sexual characteristics do provide a rough estimate of underlying hormonal activity. The assessment of Tanner stages via questionnaire measures allows inclusion of pubertal status variables in studies where direct measurement of hormones or physician examination would be impossible.

Many studies also use assessment of Tanner stages to examine the effects of pubertal timing on psychosocial development. Pubertal timing refers to the timing of overall pubertal development as compared to other adolescents of the same age. An individual can be classified as an "early," "on time," or "late" maturer in comparison with age mates. Pubertal timing is often determined by first establishing a pubertal status score for each individual within a given age group of participants. The distribution is then divided to determine extreme scores. Those with relatively low scores on pubertal maturation are considered "late maturers," while those with relatively high scores are classified as "early maturers." The rest are considered as "on time." These classifications are then used to study relationships between pubertal timing and psychosocial development. However, the exact methods used to derive these groups vary widely across studies, making comparisons of findings across studies difficult (Graber et al., 1996).

Pubertal status and pubertal timing are closely interrelated, particularly in early puberty. For example, measurement of pubertal status in a hypothetical group of 12-year-old males may reveal that a third have not yet started showing signs of puberty, a third are showing very early signs of puberty, and a third are showing definite signs of pubertal development. The first group might then be classified as "late maturers," the middle group as "on time," and the third group as "early maturers." By definition, then, pubertal status and pubertal timing would be highly correlated, because all early maturers would be more developed than would the late maturers. This confound makes it difficult to disentangle the effects of pubertal status and pubertal timing during early adolescence.

Another difficulty inherent in this method is that the rate of individual progress through puberty varies across individuals, making classification of pubertal timing somewhat unstable. A 12-year-old boy may start puberty later than his age mates, but complete maturation at the same time. He would be then be reclassified from a "late maturer" to an "on-time maturer." It is not until puberty is complete that status differences disappear, leaving only timing differences (Graber et al., 1996), at which point classifications are often based on some marker of pubertal completion, such as menarche in females.

Recent advances in neuroimaging suggest that puberty may affect neural systems thought to underlie temperament. The hippocampus and amygdala, thought to be important in emotion, contain very high concentrations of gonadal hormone receptors (Giedd et al., 1996). These same structures show signs of change and growth during the adolescent years, suggesting that these changes may be related to pubertal hormones (Giedd et al., 1996; Sowell & Jernigan, 1998). In addition, areas important in executive functioning show substantial maturation during the adolescent period and into early adulthood (Klingberg, Vaidya, Gabrieli, Moseley, & Hedehus, 1999; Lewis, 1997; Paus et al., 1999; Sowell & Jernigan, 1998; Sowell, Thompson, Holmes, Jernigan, & Toga, 1999; Thompson et al., 2000). Findings such as these have prompted several current researchers (e.g., Dahl, 2001; Spear, 2000; Walker, 2002) to hypothesize that pubertal brain development activates or amplifies the activity of neurologically based emotional systems. Further, Dahl (2001) suggests that frontal maturation necessary for mature self-regulation lags behind activation of emotional systems, resulting in a period of emotional dysregulation. To date, this theory has not been tested empirically.

Adolescent Emotional Reactivity and Psychosocial Development

Negative Affectivity

Stereotypes of adolescent behavior often center on negative emotionality, and there is evidence to suggest that a general increase in negative affect does occur during adolescence. Larson and his colleagues (Larson & Richards, 1996) have provided an illuminating look into the daily emotional lives of adolescents via a set of studies employing the Experience Sampling Method (ESM). Participants carry an electronic pager that "beeps" them at random times throughout the day. When a participant is "beeped," he or she records his or her current emotions, thoughts, and behaviors. Results indicate that adolescents experience more extreme daily highs and lows of emotion than do their parents, as evidenced by greater variance in scores, and greater overall negative affectivity than do younger children. In fact, the amount of time experienced as "very happy" was 50% less in ninth-grade adolescents than in fifth graders.

A review of several dozen articles spanning a number of decades (Buchanan et al., 1992) reveal that a general increase in negative affect during the early adolescent years is a fairly consistent finding, particularly with regard to depressive or dysphoric mood. In addition, some (e.g., Abe & Suzuki, 1986, as cited in Buchanan et al., 1992), but not all studies (e.g., Susman, Inoff-Germain, et al., 1987, as cited in Buchanan et al., 1992) have found a peak in anxiety during the early adolescent years. Surprisingly, even though adolescents are thought to be particularly irritable, few studies have attempted to

assess irritability in adolescents, and those that have were inconclusive (e.g., Achenbach & Edelbrock, 1981, as cited in Buchanan et al., 1992).

A recent analysis of self-reported personality has also been made from individuals ages 14 and older from German, British, Spanish, Czech, and Turkish samples (McCrae et al., 2000). Within each cultural group, self-reported Neuroticism (a personality construct encompassing negative affect) declined significantly across age, with adolescent groups reporting significantly higher than average scores on the Neuroticism measure. It is important to note, however, that no scores were reported for children; it is thus impossible to determine whether scores rose in adolescence or actually declined from even higher levels in middle childhood.

While adolescents in general may experience increased negative affect, of equal interest are individual differences in temperamental negative affectivity. In the 1950s, Thomas and Chess (1977) identified nine categories of infant individual differences based on detailed parent-report of infant behavior from parents of 22 infants. Parents were asked to describe their infants' reactions to everyday situations. Parents' responses were then sorted into the following categories: rhythmicity of biological functions, activity level, approach or withdrawal from novel stimuli, intensity of mood, emotional valence of mood, adaptability, sensory threshold, distractibility, and persistence/attention span. These nine categories were then used to identify three temperamental patterns: easy, difficult, and slow-to-warm-up.

The construct of "difficult" temperament, including negative mood, withdrawal, low adaptability, high intensity, and low rhythmicity, also spawned a number of studies of early temperament. While the dimensions included in the Thomas and Chess construct

of difficulty did not prove to be psychometrically sound (Putnam, Sanson, & Rothbart, in press), they continue to be used in a number of studies pertinent to the current review.

More recent studies have further refined our understanding of the emotions and behaviors that constitute negative affect. Factor analytic studies of childhood temperament utilizing the Children's Behavior Questionnaire have consistently revealed a Negative Affectivity factor consisting of scales measuring Discomfort, Fear, Anger/Frustration, Sadness, and low Soothability (Ahadi, Rothbart, & Ye, 1993; Rothbart, Ahadi, Hershey, & Fisher, 2000). Individual differences in the affects contained within this broad construct show some degree of stability after the first few months of life. However, while these affects tend to cluster together statistically, it has been argued that different negative emotions are differentially related to externalizing behaviors, such as aggression and anger, and internalizing problem behaviors, such as depression and anxiety (Eisenberg et al., 2001; Rothbart & Bates, 1998). For example, Rothbart and her colleagues (Rothbart, Ahadi, & Hershey, 1994) found that laboratory measures of infant fear predicted childhood fear, shyness, and sadness measured via parent-report at 6- to 7-years of age. However, infant frustration predicted childhood frustration as well as childhood approach tendencies. Eisenberg et al., (2001) found concurrent relations between anger and externalizing problems and between sadness and internalizing problems.

Negative affectivity may influence psychosocial outcomes in a number of different ways. Rothbart and Bates (1998) suggest that "early individual differences likely become transformed via developmental processes into the more complex forms of adjustment of later years, and these processes may shape adjustment outcomes" (p.153).

Lee and Bates (1985), for example, found that 2-year-old distress-prone toddlers had a tendency to approach trouble more often and to resist their mothers' attempts at control. The mothers were more likely to use aversive discipline, but also to give in to their children. Lee and Bates speculated that these patterns of mother-child interaction seen in toddlerhood may precede the coercive parent-child interactions related to later aggressive behavior (Patterson, 1980). Bates, Pettit, and Dodge (1995) found that mother-report of infant difficult temperament predicted harsh parenting at age 4, which in turn predicted parent perception of externalizing behaviors in early adolescence. Caspi and his colleagues (1995) found that early irritability and resistance to control, as assessed by observer ratings, predicted later externalizing problems, while early shy and inhibited behaviors predicted later anxiety, harm avoidance, and low aggression.

Concurrent relationships between negative affectivity and psychosocial development have also been explored. A 1986 study of 141 adolescents and 240 college undergraduates (Windle et al., 1986) found significant associations between an index of "difficult temperament" (inflexibility, high distractibility, high intensity emotional responses) and both depression and perceived competence. A one-year longitudinal study involving 975 adolescents found "difficult" temperament to be associated with both delinquency and depression, as well as higher levels of stressful life events and lower levels of perceived family support (Tubman & Windle, 1995). However, findings regarding internalizing disorders are less clear than those examining externalizing disorders; overlap between measures assessing temperamental attributes such as sadness, and psychosocial problems such as depression, have raised the concern that the two types

of ratings are actually measuring one underlying pattern of behavior (Rothbart & Bates, 1998). This is not a problem that is easily solved, but one that deserves careful attention.

Puberty and Negative Affect

The relationship between puberty and change in negative affect has primarily focused on depression and aggression, rather than on changes in less pathological expression of negative affect. Buchanan et al. (1992) suggest that depression and aggression constitute a pattern of behaviors and, as such, are easier to measure than affect per se. However, they also suggest that many of the studies of behavioral change attribute these changes to the same neurological systems responsible for the underlying affect, with affect mediating the relationship between biological processes and behavior. As such, we feel it is appropriate to include studies examining the role of puberty in aggressive mood and depression under the umbrella heading of temperamental negative affect. As there is currently no definitive "best way" to study the role of puberty in psycho-social outcomes, the studies discussed include those utilizing direct measures of hormone levels, as well as both pubertal status and pubertal timing as measured by secondary sexual characteristics.

The speculation that depression may be related to puberty stems primarily from the significant gender difference in depression that arises during adolescence. Prior to adolescence, males have a slightly higher rate of depression than do females. However, at some point during the pubertal transition, the rate of depression in females increases and a 2:1, female:male ratio emerges that remains fairly consistent until menopause (Bebbington et al., 1998). The exact timing of the emergence of this gender difference

varies from study to study (e.g., Angold, Costello, & Worthman, 1998; Bebbington et al., 1998; Hankin et al., 1998), but it appears that this difference emerges sometime after age 14. Indeed, there is some evidence of increase in negative affect in 10- to 14-year-old girls during rapid estrogen rise (Brooks-Gunn & Warren, 1989), and a later follow up study showed a significant linear effect of estrogen level at Time 1 on self-reported symptoms of depression at time 2 (Paikoff et al., 1991), although Time 1 hormone levels only explained 6% of the variance in depression scores at Time 2. The NIMH study of puberty and psychopathology (Susman, 1997) found lower levels of testosterone and higher levels of adrenal androgens to be associated with negative emotion in boys, while FSH correlated with negative emotion in girls.

An additional analysis of the role of gonadal hormones in depression is provided by Angold and his colleagues (Angold et al., 1999). They assessed 9-, 11-, and 13-year-olds ($N = 4500$) for behavioral difficulties. Those scoring in the top 25% on internalizing behaviors were then recruited for a longitudinal study, along with a non at-risk group. Hormonal assays were conducted, using blood drawn at two intervals, 20 minutes apart, then averaged. Results indicated that females began to develop depression only above a particular threshold of estrogen and testosterone levels. Tanner stage and age at maturation did not contribute significantly to depression scores once hormone levels were entered into the model. The authors concluded that hormone levels, rather than the appearance of secondary sexual characteristics, were the important feature in female depression. However, the authors acknowledge that all women surpass the levels of estrogen and testosterone implicated in the study and most do not develop depression, implying that a certain threshold of hormone levels is necessary, but not sufficient, for the

onset of depression. Further, the authors acknowledge that their method of assaying hormone levels was problematic, as was their failure to standardize hormone collection with regard to menstrual cycle phase.

Other evidence linking biological pubertal processes to the onset of gender differences in depression can be seen in a recent adolescent twin study showing that adolescent females' genetic heritability for depression emerges only after pubertal onset (Silberg et al., as cited in Cyranowski, Frank, Young, & Shear, 2000). Further, menstruation, pregnancy, and childbirth can all serve as triggers for a depressive episode in women vulnerable to depression, indicating a role for hormones.

Studies examining pubertal status and internalizing problems have been largely inconclusive. Several studies have failed to find a relationship between pubertal status and depression or depressive affect in girls (see Buchanan et al., 1992, for a review), while Susman et al. (1983) actually found more pubertally advanced girls to be happier than less pubertally advanced girls. A 1939 study (Stone & Barker, as cited in Buchanan et al., 1992) found that premenarcheal girls expressed more anxiety than postmenarcheal girls, while Susman et al. (1983) found higher anxiety in 10- to 15-year-old boys who were more pubertally advanced. While not directly related to negative affect, Susman et al. found that both males and females reported less energy with increasing pubertal status, while Buchanan et al. (1992) found pubertal status to be related to variability in energy. Lack of energy is often associated with depression.

Along with pubertal hormones and pubertal status, pubertal timing has been implicated in models of female depression (Ge, Conger, & Elder, 1996 **REF?**, 2001; Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997). For example, Ge, Conger, and Elder

(2001) followed 236 adolescent girls over a 6-year period starting in 7th grade. During 10th grade, girls were classified into early-, on-time, and late-maturation groups on the basis of self-reported age of menarche. These groups were determined based upon a split in the sample of 30%, 40%, and 30%. Early maturing girls showed the highest levels of depression starting in 8th grade and continuing across the span of the study. Pubertal status also contributed significantly to variance in depression scores, as did negative life events and early depressive symptoms.

The role of pubertal hormones in aggression has also been investigated. In adults, testosterone levels tend to show concurrent relationships with aggression levels (see Tremblay, Schaal, Boulerice, Arseneault, & Soussignan, 1998, for a review). This relationship has been observed in some studies of adolescents (Scerbo & Kolko, 1994; Udry & Talbert, 1988), but not in others (Mattsson et al., 1980; Susman, 1997). In a three-year longitudinal study, Drigotas and Udry (1993) found that, while testosterone level at age 12-13 was related to both concurrent and subsequent self-reported delinquency, subsequent testosterone levels were not. The authors concluded that early testosterone levels were related to problem behaviors through early development rather than hormonal effects per se. An additional longitudinal study showed 13-year-old aggressive boys to have lower levels of testosterone than non-aggressive age mates (Tremblay et al., 1998). However, the difference was reduced by age 14 and reversed by age 16, such that aggressive boys had higher levels of testosterone. In an additional study, Tremblay et al. found testosterone levels to be related to social dominance, while body mass was related to physical aggression. It is important to note, however, that

testosterone levels can be affected by social experience just prior to hormone sampling (Susman, 1997; Tremblay et al., 1998).

Buchanan et al. (1992) suggest that there are too little data available to draw any conclusions about possible relationships between pubertal status and externalizing behaviors. What evidence does exist is fairly inconclusive. For example, Petersen and Crockett (as cited in Buchanan et al., 1992) found that impulse control was lowest in girls who were 6-12 months prior to menarche, and best in postmenarcheal girls. Paikoff et al. (1991) found an increase in delinquent behavior after early puberty, while Nottelmann et al. (1987) found a decrease. Finkelstein, von Eye, and Preece (1994) found a decrease in aggressive behavior across pubertal maturation and, while males initially reported more aggressive behaviors than girls, by late puberty these gender differences had disappeared. Brooks-Gunn, Warren, Rosso, and Gargiulo (1987) reported an interaction between pubertal status and life events: in the absence of negative life events, postmenarcheal girls were more likely to have problems, but when negative life events did occur, premenarcheal girls were more affected. In a separate but related line of study, Laitinen-Krispijn and colleagues (Laitinen-Krispijn, Van der Ende, Hazebroek-Kampschreur, & Verhulst, 1999) found slower progress through puberty to be associated with problem behaviors in both males and females participating in a study of 1300 Dutch children.

Early studies of pubertal timing in males suggested that early maturation was beneficial for males (see Buchanan et al., 1992, for a review). Early maturing males were generally found to feel more attractive and have better self-esteem than did later maturing males. However, this effect tends to disappear over time (Graber et al., 1996). Further, early maturing boys are more likely to engage in high risk behaviors (Andersson &

Magnusson, 1990, as cited in Ge, Conger, & Elder, 2001), and to manifest both internalizing distress and externalizing behaviors (Ge et al., 2001). Further, late developing males may be more "flexible," sensitive, and perceptive (Stattin & Magnusson, 1990). Ge and his associates (2001) suggest that "the past undifferentiated view of the favorable influence of early maturation on males needs to be modified" (p. 49) because early maturation in males has associated emotional and behavioral costs.

One goal of the current studies is to explore the relationship between puberty and general negative affectivity, as well as between more regulatory aspects of temperament, puberty, and depressive mood and aggression. It is hypothesized that pubertal maturation will show a linear relationship with increased negative affectivity, including temperamental frustration and the psychosocial dimensions of depressive mood and aggression, particularly in conjunction with poor self-regulation.

Approach

Another basic dimension of emotional reactivity involves approach or appetitive behaviors. Rothbart and her colleagues have titled this dimension of temperament Surgency. Factor analytic studies of Surgency in toddlers and children reveal a pattern of behavior consisting of high activity and impulsivity, low shyness, and enjoyment of high-intensity, sensation-seeking activities. In adults, Surgency is related to the personality construct of Extraversion (Rothbart, Ahadi, & Evans, 2000) and is related to individual differences in sensation seeking in adolescents (Capaldi & Rothbart, 1992).

Sensation-seeking refers to the extent of an individual's desire for novelty and intensity of sensory stimulation (Arnett, 1996; Zuckerman, 1988) and is associated with

preference for risky activities, including dangerous driving, variety of sexual experiences, drug and alcohol use, and minor criminal activity (Arnett, 1996). Adolescents are often thought to be more extreme in sensation seeking than are children or adults, and this is supported by empirical evidence (Arnett, 1996; Zuckerman, 1979). A 1996 NIDA report indicated that two-thirds of eighth graders have already tried alcohol and a quarter say that they are current drinkers. Twenty-eight percent of eighth graders say that they have been drunk at least once, and heavy drinking is reported in more than 30% of high school seniors. Adolescents and young adults have the highest rate of self-reported drug use (Kandel & Ravies, 1989) and the highest rates of sexually transmitted diseases (Irwin, 1993). Crime rates peak at age 18, then drop steeply (Gottfredson & Hirschi, 1990). So prevalent are reckless behaviors during adolescence that Moffitt (1993) has concluded that "delinquency appears to be a normal part of teen life" (p. 675). Additionally, adolescents and late teens report themselves as higher in the personality construct of Extraversion than do adults (McCrae et al., 2000).

However, it is reasonable to suggest that individual differences in approach behaviors during adolescence are as likely to affect psychosocial development as are possible general increases. Individual differences in sensation seeking are related to earlier onset and higher levels of substance use among teens (Kopstein, Crum, Celentano, & Martin, 2001), as well as reckless driving behaviors, risky sexual behaviors, and crime (Arnett, 1996). A recent Spanish study of both institutionalized and non-institutionalized adolescents (Romero, Luengo, & Sobrol, 2001) found moderate relationships between personality and temperament measures of psychoticism, impulsivity and thrill-,

adventure-, and experience-seeking and overall rates of delinquency, even after controlling for the effects of institutionalization.

Additional components of temperament may serve to moderate levels of adolescent sensation seeking. Cloninger (1987) contends that personality is composed of three orthogonal components: novelty seeking, harm avoidance, and reward dependence. Novelty seeking is manifested in exploratory activity and intense reactions to reward, while harm avoidance is the tendency to avoid aversive stimuli. Harm avoidance may be an important component of study in adolescent risk taking behaviors. Wills, Windle, and Cleary (1998) have indeed found harm avoidance to be a protective factor in adolescents at high risk for substance abuse.

Individual differences in harm avoidance may relate to individual differences in fear. Fear has been posited by Rothbart and others (Gray, 1987; Rothbart & Bates, 1998) to work as a regulatory system that suppresses approach responses during potentially harmful situations. An individual who is high in approach tendencies and low in fear may behave impulsively and without regard to consequences, while someone with strong approach tendencies who is also fearful may be better able to inhibit impulsive behaviors (Derryberry & Rothbart, 1997). Indeed, infants' fearfulness as measured in the laboratory negatively predicts mother-reported impulsivity, activity, and aggression at age 7 (Rothbart, Ahadi et al., 1994). Further, toddler fearfulness is associated with greater internalized conscience in middle childhood (Kochanska, 1991, as cited in Rothbart, Posner, & Hershey, 1995).

Implications of adolescent risk taking for psychosocial development are obvious and potentially profound. Mortality rates increase sizably during adolescence, with 85%

of adolescent deaths resulting from homicides, suicides, and accidents (Irwin, 1993). Individuals who start drinking before age 15 have lifetime rates of alcohol dependence of 40% (Dahl, 2001). Contact with the legal system, contraction of a sexually transmitted disease, or an unwanted pregnancy can have lasting effects on an adolescent's life. Moffitt, Caspi, Dickson, Silva, & Stanton, (1996) argue that risky and deviant behaviors during adolescence may constitute lifestyle "snares" that perpetuate deviant behavior in adulthood.

While adolescent risk taking sometimes does escalate into a lifelong pattern of deviant behavior, the majority of adolescent risk taking is transient in nature. Spear (2000) posits that adolescent risk taking and sensation seeking may be based in evolution. She cites evidence from animal studies indicating that "adolescents" in a variety of species (e.g., animals in the early stages of sexual maturation) show changes in social and risk taking behaviors. She argues that these behaviors evolved as a result of the transition from dependence to independence that occurs during the adolescent period. Risk taking, as evidenced by exploration of novel areas, may "help facilitate the dispersal of adolescents away from the natal family unit . . . and may have been evolutionarily adaptive as a means to avoid inbreeding" (p. 418). In both rats and non-human primates, the period analogous to human adolescence involves exploration of new areas and interactions with others away from family. In primates, males or females or both tend to emigrate from their natal group during adolescence, despite such emigration's association with considerable risk (see Spear, 2000, for discussion). While Spear speculates that this adolescent increase in exploration across species is the result of maturational changes in

the brain, very little is currently known about physiological mechanisms that may be responsible for the triggering of such behaviors.

It is hypothesized that the current study will reveal increases in temperamental Surgency concurrent with pubertal maturation in early adolescence. Further, it is hypothesized that individual differences in Surgency will be related to problem behaviors, such as deviant peer affiliation and risk-taking behaviors, in later adolescence. These hypotheses are consistent both with existing data and with theoretical perspectives such as those put forth by Spear (2000).

Affiliativeness

An additional area of interest in adolescents is that of affiliative behaviors. Affiliativeness encompasses the range of behaviors that encourage emotional connectedness in humans, such as emotional communication, intimacy, and responsiveness within interpersonal relationships. Affiliativeness also includes such behaviors as pair-bonding and nurturance of the young in both humans and animals (Cyranowski et al., 2000; Frank & Young, 2000). Gender differences in affiliative behaviors are evident during adolescence, with females showing a preference for emotional communication and intimacy in interpersonal relationships, in contrast to more male-stereotypical preference for independent activity and mastery. Meta-analysis of 50 years of personality research shows this difference to exist across culture and time (Feingold, 1994). While there is evidence to suggest that gender differences exist to a degree prior to adolescence, Larson and Richards and their associates (Larson & Richards, 1989; Richards, Crowe, Larson, & Swarr, 1998) have found evidence of an

intensification of this difference during adolescence. While boys in their Experience Sampling Method study spent an increasing amount of time alone during adolescence, girls spent less time alone and more time with peers than in childhood. In addition, they spent more time talking than did males, and their conversations increasingly focused on interpersonal matters. Girls also spent more time with the opposite sex and more time thinking about both opposite- and same-sex peers than did males.

It has been suggested that females are socialized to focus on relationship intimacy, while males are socialized to focus more on issues of personal autonomy and agency (Cyranowski et al., 2000). Intensification of gender roles may become more salient during the adolescent period as increased dating and opposite-sex interaction change adolescents' social experiences. It has also been suggested that biologically based "nurturance" systems in the brain are activated by female gonadal hormones, resulting in increased affiliative drives in adolescent females (Cyranowski et al., 2000; Frank & Young, 2000). Animal studies have shown that the neuropeptide oxytocin plays a significant role in attachment and bonding behaviors (see Insel, Winslow, & Wang, 1995, for a review). Estrogen and progesterone receptors regulate oxytocin, and estrogen regulates oxytocin receptor messenger RNA. In rats, there is a 5- to 10-fold increase in oxytocin mRNA at puberty. Behavioral data from rats and voles shows that, while sex drive then increases in both males and females, attachment behavior only increases in females (see Frank & Young, 2000, for a discussion). However, no studies to date have attempted to measure oxytocin in adolescent female humans; thus it is purely speculative at this point whether oxytocin levels and adolescent affiliative behaviors are related. An increased interest in oxytocin and its role in attachment (Uvnas-Moberg, 1999), stress

regulation (Taylor et al., 2000), and psychosocial behaviors in adult women (Turner, Altemus, Enos, Cooper, & McGuinness, 1999) may spark an interest in research in oxytocin-behavioral relationships in adolescents.

Whether based in socialization or biology, individual differences in the intensification of affiliative behaviors in adolescence can have important ramifications for psychosocial development. Adolescent relationships, both with peers and with romantic partners, "can have all the positive and destructive features of adult close relationships, and more" (Larson & Richards, 1994). Poor peer relationships are related to depression and depressive symptoms in both males and females (see Petersen et al., 1993, for a review), as is preoccupation with attachment issues (Allen, Moore, Kuperminc, & Bell, 1998). Real or symbolic breaches in affiliative bonds may constitute a particular risk factor for depression in adolescent females. In a recent study examining stressful life events in adolescent populations (Ge et al., 2001), girls with major depression were significantly more likely to have experienced a severely stressful life event during the study period than were depressed males, or control subjects of either gender. Further, 68% of the depressed girls reported a stressful "interpersonal event" in the 6 months prior to the onset of depression, compared to 14% of the depressed boys, 30% of the control girls, and 40% of the control boys. Additional studies have underscored the importance of romantic relationships in the onset of adolescent depression (Darling & Cohan, 2002; Davila, Steinberg, Kachadourian, Cobb, & Fincham, 2002; Downey & Aduk, 2002; Harper, Welsh, & Wooddy, 2002).

Consistent with the findings of Larson et al., as well as with the theoretical position of Frank & Young (2000), we hypothesize that females will show an increase in

affiliative desires concurrent with increased pubertal maturation. Further, it is hypothesized that individual differences in affiliation will be related to depressive mood in both early and late adolescence, reflecting the importance of peer and romantic relationships in healthy psychosocial functioning.

Adolescent Self-Regulation and Psychosocial Development

Effortful Control

While most theories of temperament stress individual differences in emotional reactivity, factor analytic studies of toddlers and children have revealed a voluntary behavioral control system that Rothbart and her colleagues have titled Effortful Control (Derryberry & Rothbart, 1997; Rothbart & Bates, 1998; Rothbart, Derryberry, & Posner, 1994). Effortful Control encompasses a broad range of volitional skills, including attentional, inhibitory, and activational control, and allows inhibition of a dominant response in order to perform a subdominant response. Effortful Control may be of particular interest in the study of temperament and social development (Kochanska, Murray, & Harlan, 2000; Posner & Rothbart, 1998) in that it allows a child to flexibly and consciously direct their attention, to choose between competing response tendencies, and to control more reactive aspects of emotion (Putnam, Ellis, & Rothbart, 2001).

Voluntary, effortful control of action and emotion develops somewhat later in toddlerhood and childhood than involuntary, fear-based control systems. While existing studies have not examined adolescent developmental changes in effortful control per se, adolescents in 5 different cultures report themselves as lower in the personality

dimension of Conscientiousness, a personality construct that encompasses some characteristics of effortful control, than do adults (McCrae et al., 2000). Again, however, levels of child Conscientiousness are not reported, so that it is not possible to determine any possible change in levels of Conscientiousness from childhood to adolescence.

Research on individual differences in effortful control in toddlers and children has linked it to the development of empathy, conscience, and prosocial behaviors, and to lower levels of psychopathology and maladjustment (Eisenberg, 2000; Kochanska, 1997; Kochanska et al., 2000). Moreover, longitudinal studies have identified several components of effortful control as playing an important role in adolescent psychosocial development. Low self-control (as measured by poor delay of gratification) has been identified as a concurrent risk factor for aggressive and delinquent behaviors, while successful delay of gratification is linked to adaptive behaviors (Krueger et al., 1996). Lack of control in toddlerhood, as defined by emotional lability, restlessness, short attention span, and negativism, has been implicated in externalizing behaviors in adolescents (Caspi et al., 1995). Lack of control at age 3 also plays a role in distinguishing life-course persistent antisocial offenders from those whose delinquency is limited primarily to the adolescent years (Moffit et al., 1996).

Wills and his colleagues (Wills, Cleary et al., 2001; Wills, Sandy, & Yaeger, 2001, in press; Wills, Sandy, Yaeger, & Shinar, 2001) have identified lack of self-regulation as a particularly strong factor in adolescent substance use and deviant peer associations. Good self-control in early adolescence is concurrently related to less substance use by both peers and self, while poor-self control is related to deviant peer affiliations (Wills, Cleary et al., 2001). In addition, good attentional orientation and

positive emotionality moderate the effects of parental risk on adolescent substance use (Wills, Sandy, Yaeger et al., 2001). Finally, poor self-control is related to greater problems associated with substance use, while good self-control provides protective moderation (Wills et al., in press).

Parenting, Peers, and Psychosocial Outcomes

In 1992, Patterson, Reid, and Dishion posited that parents who use coercive means of control, engage in frequent conflict with their children, and fail to monitor their children's behavior outside the home are more likely to produce aggressive, uncooperative children. These children then do poorly in school and are rejected by mainstream peers. This leads to association with deviant peers and eventual participation in deviant activities. A number of studies have found evidence supporting this model (see Dishion & Bullock, 1991, for a review), with deviant peer association identified as the "most proximal social influence on problem behavior" (Ary, Duncan, Biglan et al., 1999, p. 141).

Indeed, deviant peer association during adolescence is highly predictive of deviant behaviors (Dishion, Spracklen, Andrews, & Patterson, 1996), and poor parental monitoring is strongly associated with deviant peer involvement in early adolescence (Dishion, Capaldi, Spracklen, & Li, 1995). However, Stice and Gonzales (1998), using both parent and adolescent measures, found that both parental control and temperamental behavioral undercontrol predicted unique variance in adolescent antisocial behavior and substance use. Further, behavioral undercontrol moderated the relationship between parenting and behavior such that parenting showed stronger relations with behavior at

higher levels of temperamental risk. In the current studies, we also predict that both self-regulation and parenting behaviors will be associated with psychosocial outcomes such as prosocial and deviant peer association and activities. Further, we predict that the combination of parenting and individual difference variables will be better predictors of psychosocial outcomes than either set of predictors alone.

Executive Attentional Systems

In 1986, Norman and Shallice proposed that a supervisory or executive system is recruited when adults are confronted by situations producing conflict between competing responses. This executive system is needed in situations requiring planning, error correction, novel responses, difficult conditions, or in situations in which habitual responses must be overcome in favor of a more appropriate response (Posner & DiGirolamo, 1998). Posner and Rothbart (2000) posit that executive attention underlies effortful control skills. Individuals suffering damage to the frontal lobes of the brain often exhibit deficits in these sorts of behaviors, leading to speculation that individual differences in executive behaviors may be related to individual differences in functioning of prefrontal brain areas (Giancola & Tarter, 1998). A variety of neuropsychological measures have been designed to measure executive cognitive functioning, including tasks that require inhibition of inappropriate responses, planning, sequencing, and word fluency as well as other skills (Giancola & Tarter, 1998).

A number of studies have found relationships between poor executive cognitive functioning and delinquency (see Moffit & Henry, 1991, for a review). White et al. (White et al., 1994) found a small, but significant relationship between performance on a

battery of neuropsychological tasks and delinquency in early adolescence. These tasks included a time perception task, the Stroop Color and Word Association Task, the Trail Making Test, the Circle Tracing task, a Delay of Gratification game, and a computerized Card Playing task. They also found modest relationships between performance on the tasks and teacher-report impulsivity. However, while neurocognitive functioning was concurrently related to antisocial behavior at two time points (age 10 and age 12), age 10 task performance did not predict age 13 delinquency, while age 10 teacher ratings of impulsivity did.

In a series of studies, Giancola and his associates (Giancola, 2000; Giancola et al., 1998; Giancola, Moss, Martin, Kirisci, & Tarter, 1996; Giancola & Zeichner, 1994) found relationships between poor executive functioning, as measured by neuropsychological tasks such as the Wisconsin Card Sorting Test, the Porteus Mazes, the Tower of Hanoi, and the Stroop test, and aggression in young men (Giancola & Zeichner, 1994) as well as a greater degree of alcohol-induced aggression in individuals with deficits in frontal functioning (Giancola & Zeichner, 1994). Preadolescents with a family history of substance abuse disorder also show poor frontal functioning as measured by these tasks when compared to controls (Giancola & Zeichner, 1994). In one of the few studies to specifically examine frontal functioning in adolescent females, poor performance on neuropsychological tasks predicted antisocial behaviors as hypothesized (Giancola et al., 1998), suggesting that poor executive functioning is associated with poor psychosocial outcomes across genders. In 15- to 18-year-old males, Giancola found a significant relationship between poor executive functioning and negative affectivity, both of which were higher in youths at familial risk for substance use disorders. While poor

executive functioning was associated with drug use in the sample studied, this relationship was only evident in individuals with a family history of substance abuse, suggesting that individuals with poor executive functioning in combination with family risk factors may be especially vulnerable to developing substance use disorders.

Performance on measures of neuropsychological functioning such as the Wisconsin Card Sorting Test, California Verbal Learning Test-Children's Version, Word Fluency, Animal Naming and Desing Fluency, the Twenty Questions task, the Go/No Go task, the Tower of London, and Delayed Alternation task, has been shown to improve from childhood through adolescence (Levin, Culhane, Hartmann, Evankovich, & et al., 1991). Specifically, Levin et al. (1991) found majors gains between a 7- to 8-year-old group and a 9- to 12-year-old group on the Wisconsin Card Sort and false-positive errors on the Go/No Go Task. However, further advances in performance in 13-15 year olds were confirmed in a group of 13-15 year olds for the remained of the tasks.

In addition, Williams, Ponesse, Schachar, Logan, and Tannock (1999) found evidence for increased ability to inhibit a response during a Go/No Go task into adulthood. It has been suggested, however, that maturation of executive functioning may be different in individuals with antisocial behavior disorders. A 1999 cross-sectional study of normally developing and behaviorally disturbed children ages 6-16 found improved competence on measures of executive functioning across age, regardless of behavioral difficulties (Mezzacappa, Kindlon, & Earls, 1999). However, children with externalizing disorders showed lower levels of executive functioning at all ages than did non-disordered children, indicating a stable deficit in frontal functioning. These findings

suggest that the relationship between executive functioning and psychosocial outcomes may be present, and measurable, early in life.

In the current set of studies, we predict that effortful control variables, as measured both by self- and parent-report, will be related to performance on a newly developed measure of executive attention task in older adolescence, as well as to performance on a measure of executive attention designed to tap both cognitive and emotional attention. Further, we predict that both questionnaire measures of self-regulation and performance on executive attention tasks will predict psychosocial outcomes. Further, we predict that parenting and self-regulation variables will contribute both uniquely and jointly to the prediction of psychosocial outcomes, including both prosocial and problem behaviors.

Preliminary Studies

Evidence for an important role of temperamental individual differences in adolescent psychosocial development suggests that this line of study is an important one. This prompted our 1998 project to revise and update the Early Adolescent Temperament Questionnaire (EATQ; Capaldi & Rothbart, 1992; Ellis & Rothbart, 2002). While the EATQ has been shown in two separate studies to be a valid and reliable measure of many aspects of adolescent temperament, we felt that it did not contain sufficient scales to measure fully the subcomponents of effortful control. Thus, we added scales designed to do so, and embedded scales measuring aggression and depressive mood within the instrument to examine possible relationships between temperament and social-emotional functioning.

We administered the questionnaire to 177 school students (82 males, 94 females, 1 unidentified), aged 10-15 years. In addition, a parent-report version was completed by 62 parents of adolescent participants. Our examination of the relation of temperament to psychosocial behavior underscored our belief that temperament, and particularly effortful control, plays an important role in adolescence. Multiple regression analyses revealed that low Effortful Control, high Surgency, and low Affiliativeness best predicted aggression scores, while low Effortful Control, high Affiliativeness, high Frustration, and gender (i.e., being female), best predicted depressive mood scores. In both cases, examination of standardized beta weights revealed Effortful Control to predict the greatest amount of variance.

Recent research has sought to relate the study of effortful control to the operation of high-level attention networks (Posner & Rothbart, 2000). One widely used measure of the ability to resolve cognitive conflict is the Stroop task. Stroop tasks require that participants name the ink color of a printed word, while ignoring the content of the word. In compatible conditions, ink color matches the meaning of the printed word (e.g., "red," printed in red ink), while incompatible conditions involve ink color that is different than the meaning of the word (e.g., "red," printed in green ink). The latter condition induces conflict, and requires participants to suppress automatic processing of the semantic content of the word to name the ink color, resulting in longer reaction times (RTs).

The neural networks involved in such tasks have been studied fairly extensively in adults. Conflict tasks as diverse as the color-word Stroop effect (Bush, Luu & Posner, 2000), the numerical Stroop task (Bush et al., 1998), and the use of congruent and incongruent flankers (Botvinick, Nystrom, Fissell, Carter, & Cohen, 1999) have all

shown activity in the anterior cingulate cortex (ACC), often in conjunction with lateral frontal areas (Bush, Luu & Posner, 2000). Imaging studies have also revealed a failure of ACC activation in adults with ADHD during a counting Stroop task (Bush et al., 1999).

Emotional Stroop-type tasks, involving presentation of negatively valenced versus neutral words, also activate the anterior cingulate, in an area of ACC that connects to the amygdala, hypothalamus, hippocampus and other areas important in regulation of emotional responses (Bush, Luu, & Posner, 2000). Measures of this type have been used extensively in studies investigating cognitive bias in psychopathology. A 1996 review of these studies (Williams, Matthews, & MacLeod) concluded that, in general, patient populations suffer cognitive interference, resulting in poor task performance, when presented with emotional stimuli related to their current condition. This effect has been studied in numerous disorders, such as PTSD, depression, and anxiety in adults (e.g., McNeil, Tucker, Marand, Lewin, & Nordgran, 1999), depression and anxiety in 9- to 18-year-olds (Doost, Taghavi, Moradi, Yule, & Dalgleish 1997), PTSD in children and adolescents (Moradi, Taghavi, Doost, & Dagleish, 1999), and anxiety in adolescents (Richards, Richards, & McGeeney, 2000). These findings suggest that executive attention may also play an important role in the development of internalizing disorders, perhaps due to an inability to shift attention from emotionally charged stimuli.

Drs. Rothbart and Posner have used neural marker tasks, shown by imaging studies to activate particular regions of the brain, to trace the early development of attentional networks and to relate this development to caregiver-report of temperamental effortful control and affect. Gerardi-Caulton (2000) developed a Stroop task appropriate for use with children as young as 24 months-of-age. The task introduced conflict

between the location of an event and its identity. Stimuli were presented on either the left or right side of a computer monitor. On either side of the monitor were two large "buttons" containing a picture. The children were instructed to touch the button that matched the picture on the screen. In the compatible condition, the picture appeared on the same side of the screen as the correct button. In the incompatible condition, the picture appeared on the side of the screen opposite the correct button.

There is a strong tendency to respond to the location of the stimulus, when put in conflict with the identity. When the correct key is on the opposite side, a conflict emerges and even adults show longer reaction times (RTs) and higher error rates on these conflict trials. It was found that children of two years were almost always able to make the correct response on compatible trials but were almost always incorrect on incompatible trials. Three-year-olds, however, made fewer errors although, like adults, they had longer RTs on incongruent trials. This finding has since been replicated in a cross-sectional study of toddlers 24-, 30-, and 36-months of age (Rothbart, Ellis, Rueda, & Posner, 2002).

Gerardi-Caulton (2000) found that performance in the spatial conflict task was related to effortful control, as measured in both the laboratory and via parent report temperament scales. The recently completed cross-sectional study (Rothbart et al., 2002) also found a relation between performance on the spatial conflict task and caregiver reports of temperamental effortful control. Additionally, both studies found that children better able to resolve the conflict introduced by spatially incompatible trials had lower scores on caregiver-reported negative affectivity.

The Current Studies

As described previously, a number of recent studies have suggested that areas of the brain important in executive functioning, as well as areas important in emotion, undergo significant development during the adolescent years (Giedd et al., 1996; Jernigan, Trauner, Hesselink, & Tallal, 1991; Klingberg et al., 1999; Paus et al., 1999; Sowell & Jernigan, 1998; Sowell et al., 1999). It has been further suggested that this development plays a role in adolescent behavior, self-regulation, and the onset of psychopathology (Dahl, 2001; Spear, 2000; Walker, 2002). Individual differences in temperamental emotional reactivity and self-regulation, as well as performance on tasks related to neural systems thought to underlie self-regulation, have been identified in previous studies as important in adolescent psychosocial outcomes. These findings, in conjunction with the temperament and attention studies in our laboratory, prompted development of the current set of studies.

In Study 1, we sought to relate the physiological changes associated with puberty to increases in temperamental reactivity in a community sample of early adolescents. Because it was not feasible to measure directly hormone levels or brain changes, we used secondary sexual characteristics as a proxy measure of underlying hormonal activity. We hypothesized that emotional reactivity, encompassing surgent behaviors and frustration, depressive mood and aggression, would be higher in more pubertally advanced early adolescents. Further, we predicted that pubertal maturation combined with relatively poor effortful control would best predict scores on depressive mood and aggression. Based on our prior research (Ellis & Rothbart, in preparation), it was also predicted that

approach tendencies, or surgency, would be related to aggression but not to depressive mood, while affiliativeness would predict depressive mood, but not aggression.

In Study 2, we utilized an ethnically diverse sample of 16- and 17-year-olds, in which one subgroup had been identified in middle school as being "at risk," and another as "high risk" for the development of anti-social behaviors. Participants were asked to report on family variables such as parental control, rules, and relationship quality, as well as their own involvement with prosocial and anti-social peers. We sought, first, to relate parent- and self-report effortful control to performance on measures of both cognitive and emotional conflict. Specifically, we predicted that individuals with relatively poor Effortful Control would show relatively greater interference in these tasks. In addition, we predicted that overall attention interference would be positively related to negative affectivity and that emotional conflict would be related to higher levels of depressive mood. Second, we sought to better understand the contributions of temperament and executive attention to aggression, depressive mood, and both pro- and anti-social peer affiliation and behaviors. This allowed examination of individual differences within the context of risk category, parenting, and family relationship variables. Specifically, we predicted that risk category and family variables would contribute to psychosocial outcomes, but that prediction would improve significantly with the addition of individual difference variables.

A secondary focus of both studies was to replicate and extend our previous findings (Ellis & Rothbart, 2002) with regard to the psychometric properties of the EATQ-R, as well as to explore areas of agreement and disagreement between self- and parent-report in two samples varying in age and background. The set of studies provided

an excellent opportunity to assess the EATQ-R as an instrument appropriate for use across a wide range of ages, ethnic groups, and risk groups.

The following chapters detail the methodology and results of each study in turn, including first a discussion of descriptive findings and psychometrics of the instruments, followed by discussion of the primary hypotheses for the specific study. This is followed by a more general discussion that includes limitations of the current studies and suggestions for future research.

CHAPTER II

STUDY I

Introduction

The primary goals of Study 1 were to explore the relation between pubertal maturation and temperament during early adolescence, and to evaluate the role of individual differences in both temperament and pubertal status in depressive mood and aggression. Specifically, it was hypothesized that emotional reactivity would increase with pubertal maturation as suggested in previous studies and by recent theorists. Further, it was hypothesized that both temperament and pubertal maturation would contribute significantly to explanation of scores on depressive mood and aggression. Secondarily, Study 1 sought to replicate and extend the findings of our previous study of adolescent temperament (Ellis & Rothbart, in 2002) on the psychometric properties of the EATQ-R and agreement between parent and adolescent reporters.

Participants

Participants in Study 1 were 165 adolescents (mean age = 12.31; *SD* = 1.58) and his or her primary caregiver. Caregiver respondents were assumed to be primarily

mothers of participants; however, parent participants were not asked to report their gender. Seventy-seven females (mean age = 12.38; *SD* = 1.70) and 71 males (mean age = 12.24; *SD* = 1.25) participated. One female participant failed to answer approximately one-half of the questions asked; her responses were not included in analyses. Participants were not asked about their ethnic backgrounds and the investigator did not meet the participants; however it is assumed that the majority of participants were European-American, reflecting the demographic composition of Eugene and the surrounding area. Participants were recruited by telephoning parents/caregivers listed in a database derived from birth announcements published in a local newspaper. Adolescent participants received a $5.00 gift certificate redeemable at a local mall as a token of appreciation for participation. Parent/caregiver participants did not receive compensation for participating.

Measures

Temperament Questionnaire

In 1998, we (Ellis & Rothbart, 2002) initiated a project to revise the Early Adolescent Temperament Questionnaire (EATQ; Capaldi & Rothbart, 1992). A number of important changes were made in an effort to develop an instrument appropriate for use in studies of development and psychosocial outcomes. First, we added scales designed to measure Effortful Control. Second, we included scales designed to measure depressive mood and aggression. However, due to conceptual overlap between items assessing sadness and depressive mood, and items assessing anger and aggression, scales

measuring sadness and anger were not included. Third, we developed a scale intended to measure affiliative behaviors.

We administered the revised instrument to 176 adolescents between 10- and 15-years of age. In addition, 62 parents filled out a parent-report form of the instrument. We then conducted analyses assessing scale reliability, dimensionality, and discriminant validity, and made further revisions by excluding scales that did not achieve acceptable coefficient alpha levels. Coefficient alpha for the remaining scales ranged from .65 - .82. Convergence with parent report was modest for most scales, but poor for depressive mood in both genders and, in boys, for shyness and inhibitory control. We performed exploratory factor analyses of the temperament scales and found four clear factors: Effortful Control, made up of scales measuring Attention, Inhibitory Control, and Activation Control; Surgency, including scales measuring High Intensity Pleasure and, loading negatively, Shyness and Fear; Negative Affectivity, including the Frustration scale as well as the two socio-emotional scales, as well as a clear Affiliativeness factor comprised of scales measuring Affiliation, Perceptual Sensitivity, and Pleasure Sensitivity.

With the exception of the emergence of the Affiliativeness factor, our findings were consistent with previous research on the broad constructs of temperament in childhood; however, factor loadings were somewhat different, particularly with regard to the loading of Fear on the Surgency factor rather than with Negative Affectivity. We then took 4-9 items from each scale that loaded on a factor, and combined them to make one broad scale containing separate subscales. This procedure was repeated with the parent-report form. This allowed us to create a relatively short instrument that still

contains the breadth needed to measure important aspects of temperament such as Effortful Control.

This shortened instrument became the Early Adolescent Temperament Questionnaire - Revised (EATQ-R), which contains 65 questions in the self-report form, and 62 questions in the parent-report form. The self-report form asks adolescents how true each statement is for them; parent-report form asks the parent/caregiver to characterize the truth of each statement as it refers to his or her child. Response options for both forms used a 5-point Likert-type scale: 1 = Almost always untrue; 2 = Usually untrue; 3 = Sometimes true, sometimes untrue; 4 = Usually true; and 5 = Almost always true.

Both forms include scales designed to measure temperamental Effortful Control, Affiliativeness, Surgency, and Negative Affectivity. However, the parent-report form does not include Perceptual Sensitivity and Pleasure Sensitivity subscales within the Affilativeness scale. These subscales were not included because they contain items that would be very difficult for an observer to judge about another person (e.g., "I tend to notice little changes that others do not notice."). Table 1 contains definitions and sample items for each subscale, while Appendix A contains a full listing of items by scale.

Scoring

Appropriate items are reverse scored, then subscale scores are calculated as a mean score of applicable scale items. The scales are scored so that a high score indicates that the assessed dimension is high for that individual. Missing items are not included in

TABLE 1. EATQ - R Subscale Definitions and Sample Items

Scale	*Subscale*	*Definition and Sample Item*
Effortful Control	Activation Control	The capacity to perform an action when there is a strong tendency to avoid it. "If I have a hard assignment to do, I get started right away."
Affiliativeness	Attention	The capacity to focus attention as well as to shift attention when desired. "I pay close attention when somebody tells me how to do something."
	Inhibitory Control	The capacity to plan, and to suppress inappropriate responses. "It's easy for me to keep a secret."
	Affiliation	The desire for warmth and closeness with others, independent of shyness or extraversion. "It is important to me to have close relationships with other people."
	Perceptual Sensitivity	Detection or perceptual awareness of slight, low-intensity stimulation in the environment. "I tend to notice little changes that other people do not notice."
	Pleasure Sensitivity	Amount of pleasure related to activities or stimuli involving low intensity, rate, complexity, novelty, and incongruity. "I like the crunching sound of autumn leaves."
Surgency	High Intensity Pleasure	The pleasure derived from activities involving high intensity or novelty. "I wouldn't be afraid to try something like mountain climbing."
	Fear (reverse scored)	Unpleasant affect related to anticipation of distress. "I worry about getting into trouble."
	Shyness (reverse scored)	Behavioral inhibition to novelty and challenge, especially social. "I am shy about meeting new people."
Negative Effect	Frustration	Negative affect related to interruption of ongoing tasks or goal blocking. "I get irritated when I have to stop doing something I'm enjoying."
	Depressive Mood	Unpleasant affect and lowered mood, loss of enjoyment and interest in activities. "My friends seem to enjoy themselves more than I do."
	Aggression	Hostile and aggressive actions, including person- and object-directed physical violence, direct and indirect verbal aggression, and hostile reactivity. "I pick on people for no real reason."

calculation of the mean. Scale scores are calculated as a mean of appropriate subscale scores; for example, Effortful Control scores consist of the mean of the Attention, Inhibitory Control, and Activation Control subscale scores. In the case of Surgency,

subscale scores for Fear and Shyness are reversed prior to calculation of the Surgency mean score.

Pubertal Status

Pubertal status was assessed via parent- and self-report versions of the Body Changes Questionnaire, a scale adapted from Carskadon and Acebo (1993) and based on Petersen et al.'s (Petersen, Crockett, Richards, & Boxer, 1988) interview-based Pubertal Development Scale. The Pubertal Development Scale (PDS) was developed for use in studies for which direct measures of pubertal status, such as physician assessment, is not feasible. A three-year longitudinal study (Petersen, Crockett, Richards et al., 1988) found PDS scales to be internally reliable (coefficient alpha: .68 - .83, median alpha = .77). Correlations between PDS questionnaire reports and physician ratings for female subjects (Brooks-Gunn et al., 1987) were generally high (.61 - .67). In the current version, both males and females were asked to report on pubertal development of body hair growth and skin changes; males were also asked about voice changes and facial hair growth and females were asked about breast growth and menstruation. Most questions had response options ranging from 1 - "Hasn't started" to 4 - "Seems complete." In addition, respondents could answer that they didn't know. Female menstrual status was assessed via a yes or no response, and if "yes," age of menarche was also assessed. Caregiver forms were modified such that questions referred to "your child." The original Carskadon and Acebo scale also contained an item assessing growth spurt; the current study did not include an item assessing growth spurt. The complete questionnaires are included in Appendix B.

Scoring

All questions for males and questions 1 to 3 for females were scored as follows: a = 1, b = 2, c = 3, d = 4, and 5 = no score given. Question 4 for females was scored as follows: "no" = no score given, "yes" = 4. Overall scores for both self- and parent-report were calculated as a mean of all items for which a score was given. A composite score was calculated that represented the mean of parent- and self-report scores.

In addition, each participant was assigned a Puberty Category Score, using a modification of procedures used by Carskadon and Acebo (1993). For self- and parent-report male forms, responses for questions 1, 3, and 4 (body hair, voice change, and facial hair) were added together, and a composite score calculated representing the mean of parent- and self-report. This provided a multiple respondent score rather than a single respondent score as calculated by Carskadon and Acebo. Categories were determined by composite score point values: Prepubertal = 3, Early Pubertal = 3.5 - 5, Midpubertal = 5.5 - 8, Late pubertal = 8.5 – 11, and Postpubertal = 12. For both self- and parent-report female forms, responses for questions 1 and 3 (body hair and breast growth) were added together, and a composite score was calculated that represented the mean of parent-and self-report. Categories were determined by composite score values in addition to menstrual status: Prepubertal = 2, Early Puberty = 2.5 – 4, Mid-pubertal = 4.5 - 6 and no menarche, Late pubertal = 7 or less and menarche, Postpubertal = 8 and menarche.

General Procedure

After being contacted by phone and giving initial agreement to participate, caregivers were mailed packets containing all parent- and self- report questionnaires, as well as consent forms for parent participants and assent forms for adolescent participants. An instruction letter specified that parent and adolescent participants should complete the questionnaires independently (see Appendix C). A plain envelope was provided in which adolescent participants were instructed to seal their completed questionnaires. This envelope was then included with completed caregiver questionnaires and returned to the principal investigator in a self-addressed, stamped envelope.

RESULTS

Descriptive and Psychometric Properties of the EATQ - R

A series of item-total analyses were performed for subscales and scales by reporter. Coefficient alpha (Cronbach's) was estimated for each scale and subscale. For self-report scales, alpha ranged from .67 - .80 and alpha for subscales ranged from .55 - .78 (see Table 2). For parent-report, scale alphas ranged from 70 - .87 and alpha for subscales ranged from .56 - .82. Average inter-item correlation was calculated for each subscale to further insure internal consistency even within small clusters of items covering broad dimensions of behavior. Subscale mean inter-item correlations averaged .37.

Agreement between Reporters

Convergence between self- and parent-report was assessed using a series of

Pearson's correlations. Agreement between self- and parent-report scores by gender and total is reported in Table 3. Convergence for males and their parent ranged from .22 - .65

TABLE 2. Cronbach's Alpha Scale and Subscale Reliabilities by Reporter, Study 1

Scale	*Subscale*	*Self Report*	*Parent Report*
Effortful Control		.80	.87
	Activation Control	.73	.81
	Attention	.62	.73
	Inhibitory Control	.57	.56
Affiliativeness		.76	-
	Affiliation	.66	.70(a)
	Perceptual Sensitivity	.66	-
	Pleasure Sensitivity	.77	-
Surgency		.67	.80
	High Intensity Pleasure	.61	.74
	Fear (reverse scored)	.55	.74
	Shyness (reverse scored)	.78	.90
Negative Affect		.79	.88
	Frustration	.72	.79
	Depressive Mood	.64	.75
	Aggression	.74	.82

[a]Only the Affiliation subscale is included in parent report Affiliativeness

and agreement was statistically significant for all scales and subscales with the exception of Inhibitory Control, which was significant at trend level. Agreement between females and their parent ranged from .22 - .51, and was statistically significant or marginally significant for all scales and subscales. With genders combined, agreement was statistically significant for all scales and subscales, ranging from .29 - .53.

TABLE 3. Pearson's Correlations between Self- and Parent-Report Temperament, Study 1

	Male $n = 70$	*Female* $n = 76$	*Total*
Effortful Control	.54**	.41**	.50**
Activation Control	.65**	.37**	.53**
Attention	.35**	.42**	.42**
Inhibitory Control	.22+	.22+	.29**
Affiliation	.36**	.38**	.42**
Surgency	.40**	.48**	.46**
High Intensity Pleasure	.54**	.37**	.48**
Fear	.37**	.27*	.33**
Shyness	.33**	.51**	.47**
Negative Affect	.42**	.38**	.38**
Frustration	.36**	.23*	.30**
Depressive Mood	.34**	.28*	.33**
Aggression	.43**	.40**	.41**

+ $p < .10$; * $p < .05$; ** $p < .01$

Scale means by gender and reporter are presented in Table 4. Female participants consistently rated themselves higher on Effortful Control subscales than did their parent (Activation Control; $t(75) = 3.27$, $p < .01$; Attention; $t(75) = 2.53$, $p < .01$; Inhibitory Control; $t(75) = 1.83$, $p = .07$, total Effortful Control; $t(75) = 3.37$, $p < .001$). In addition, they rated themselves higher on the Fear subscale ($t(75) = 3.08$, $p < .01$) and lower in overall Surgency ($t(75) = -3.47$, $p < .01$). Further, females reported themselves higher in

Frustration than did their parent ($t(75) = 2.19$, $p < .05$), and lower in Aggression ($t(75) = -6.40$, $p < .001$).

TABLE 4. Temperament Scores
by Gender and Reporter, Study 1

Scale	*Self, Female* $n = 76$ *M (SD)*	*Mother, Female* $n = 76$ *M (SD)*	*Self, Male* $n = 70$ *M (SD)*	*Mother, Male* $n = 70$ *M (SD)*
Effortful Control	3.74(.53)	3.52(.54)**	3.57(.57)	3.38(.57)**
Activation Control	3.67(.75)	3.37(.71)**	3.54(.88)	3.09(.80)**
Attention	3.62(.56)	3.42(.69)**	3.47(.66)	3.30(.63)*
Inhibitory Control	3.92(.66)	3.77(.53)*	3.69(.63)	3.73(.58)
Affiliation	3.99(.63)	4.03(.49)	3.36(.76)	3.74(.83)**
Surgency	3.26(.57)	3.47(.49)**	3.36(.52)	3.48(.57)+
High Intensity Pleasure	3.14(.79)	3.43(.65)	3.27(.71)	3.37(.73)
Fear	2.92(.75)	2.65(.62)**	2.66(.73)	2.34(.69)**
Shyness	2.43(.98)	2.37(.82)	2.53(.95)	2.56(.97)
Negative Affect	2.52(.48)	2.62(.59)	2.68(.82)	2.58(.55)
Frustration	3.31(.71)	3.10(.69)*	3.37(.67)	2.99(.67)**
Depressive Mood	2.49(.64)	2.48(.70)	2.48(.69)	2.32(.67)+
Aggression	1.76(.60)	2.31(.72)**	2.19(.68)	2.42(.66)**

Paired Samples *t* test
Difference between parent- and self-report: + $p < .10$, * $p < .05$, ** $p < .01$.

Males also rated themselves higher in Activation Control ($t(70) = 5.05$, $p < .001$), Attention ($t(70) = 2.12$, $p < .05$) and total Effortful Control ($t(70) = 3.04$, $p < .01$) than did their parent, but not Inhibitory control. Males reported themselves as lower in

Affiliation ($t(70) = -3.57$, $p < .01$), higher in Fear ($t(70) = 3.30$, $p < .01$; overall Surgency; ($t(70) = -1.77$, $p = .08$), higher in Frustration ($t(70) = 4.23$, $p < .001$), and lower in Aggression ($t(70) = -2.70$, $p < .01$) than did their parent.

Gender Differences

Gender differences were also examined. Females reported themselves as significantly higher on subscales measuring Affiliation ($t(144) = -5.34$, $p < .001$), Pleasure Sensitivity ($t(144) = -3.39$, $p < .001$), and Fear ($t(144) = -2.00$, $p < .05$) than did males; and higher in Inhibitory Control at trend level ($t(144) = -1.95$, $p = .053$). Self reported Aggression was significantly higher for males in this sample than for females ($t(144 = 3.91$, $p < .001$). Gender differences in scale scores reached significance for Affiliativeness (females higher, $t(144) = -3.83$, $p < .001$), and trend level for both Effortful Control (females higher, $t(144) = -1.76$, $p = .08$) and Negative Affectivity (males higher, $t(144) = 1.89$, $p = .06$).

Correlations between Temperament Scales and Socio-Emotional Scales

Correlations between temperament scale scores are presented in Table 5, with parent-report correlations presented above the diagonal, and self-report presented below. In both sets of reporters, Effortful Control was negatively related to Frustration, Aggression, and Depressive Mood. Depressive Mood was negatively related to Surgency and positively related to Aggression and Frustration in both parent- and self-report. Aggression was positively related to Frustration and negatively related to Affiliation in both parent- and self-report. Frustration and Surgency were also negatively related in

both sets of reporters. In addition, parent-report Effortful Control was related to parent-report Surgency. This relationship was not evident in self-report; however, self-report Effortful Control and Affiliation were positively related at trend level. Parent-report Depressive Mood was negatively related, at trend level, to Affiliation.

TABLE 5. Pearson's Correlations – Self-Report Temperament
Pearson's Correlations between Scales, Study 1

	1	*2*	*3*	*4*	*5*	*6*
1-Effortful Control	-	.04	.24**	-.40**	-.35**	-.46**
2-Affiliation	.15+	-	.27**	-.27**	-.16+	-.09
3-Surgency	.07	.13	-	-.19*	-.50**	-.23**
4-Aggression	-.58**	-.19*	-.02	-	.35**	.65**
5-Depressive Mood	-.48**	.07	-.32**	.31**	-	.51**
6-Frustration	-.28**	-.02	-.25**	.31**	.36**	-

Parent –report values above the diagonal, self-report values below
+ $p < .10$, * $p < .05$, ** $p < .01$

Body Changes Questionnaire

Means and standard deviations for both pubertal status scores and puberty categories by age and gender are presented in Table 6, and are illustrated in Figures 1 and 2. Eighteen participants (4 female) were classified as prepubertal, 66 (26 female) as early pubertal, 44 (31 female) as mid-pubertal, and 18 (15 female) as late pubertal. No participants reached scoring criteria to be classified as post-pubertal.

Age and Gender Differences

To investigate age and gender differences in Puberty Category scores, a univariate analysis of variance was performed, with age and gender entered as independent variables. Significant main effects of both age ($F(4, 136) = 23.05$, $p < .001$) and gender ($F(1, 136) = 20.89$, $p < .001$) were present, indicating an increase in scores across age for

TABLE 6. Descriptive Statistics – Puberty Category and Pubertal Score by Age

	10	***11***	***12***	***13***	***14 and older***	***Total***
n	6	60	37	15	28	146
Females	3	34	16	8	15	76
Males	3	26	21	7	13	70
Mean Puberty Category	1.50(.55)	2.17(.69)	2.14(.67)	2.87(.74)	3.32(.77)	2.43(.86)
Females	1.67(.57)	2.44**(.66)	2.44*(.63)	3.25*(.71)	3.73*(.46)	2.75(.84)**
Males	1.33(.58)	1.81(.57)	1.90(.63)	2.43(.54)	2.85(.80)	2.07(.75)
Mean Pubertal Score	3.08(.86)	4.34(1.21)	4.43(1.27)	5.57(1.06)	7.27(1.47)	5.00(1.73)
Females	2.67(.77)	4.50(1.33)	4.53(1.42)	5.75(1.14)	7.36(.95)	5.13(1.74)
Males	3.50(.87)	4.15(1.02)	4.38(1.17)	5.36(1.03)	7.15(1.71)	4.86(1.71)

Independent Samples T-Test, Gender Difference: *p<.05, **p<.01

both genders, as well as higher scores at each age for females than for males. Pubertal Status scores could not be compared across genders as scores were calculated using different criteria;[1] therefore one-way ANOVA was conducted separately for each gender.

[1] Males receive 1, 2, 3, or 4 points for question 4, females receive 0 or 4 according to menstrual status. This difference creates smaller relative scores for females prior to menarche and larger relative scores after.

Significant linear increases across age were observed for both male ($F(4, 66) = 23.67$, $p < .001$) and female ($F(4, 71) = 28.87$, $p < .001$) participants.

Agreement between Raters

Self- and mother-report pubertal scale scores were compared within gender. For males, scores between self and mother were significantly correlated ($r = .67$, $p < .001$); as

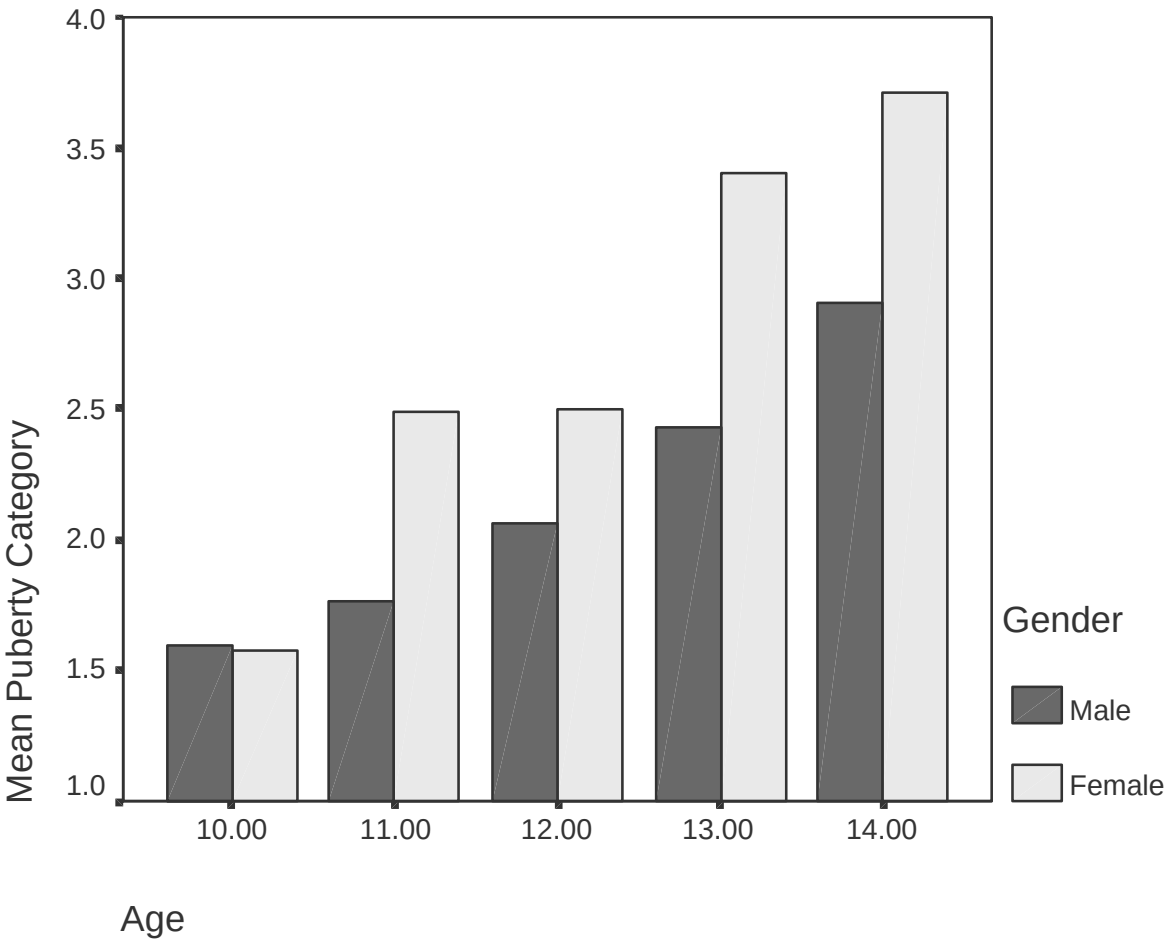
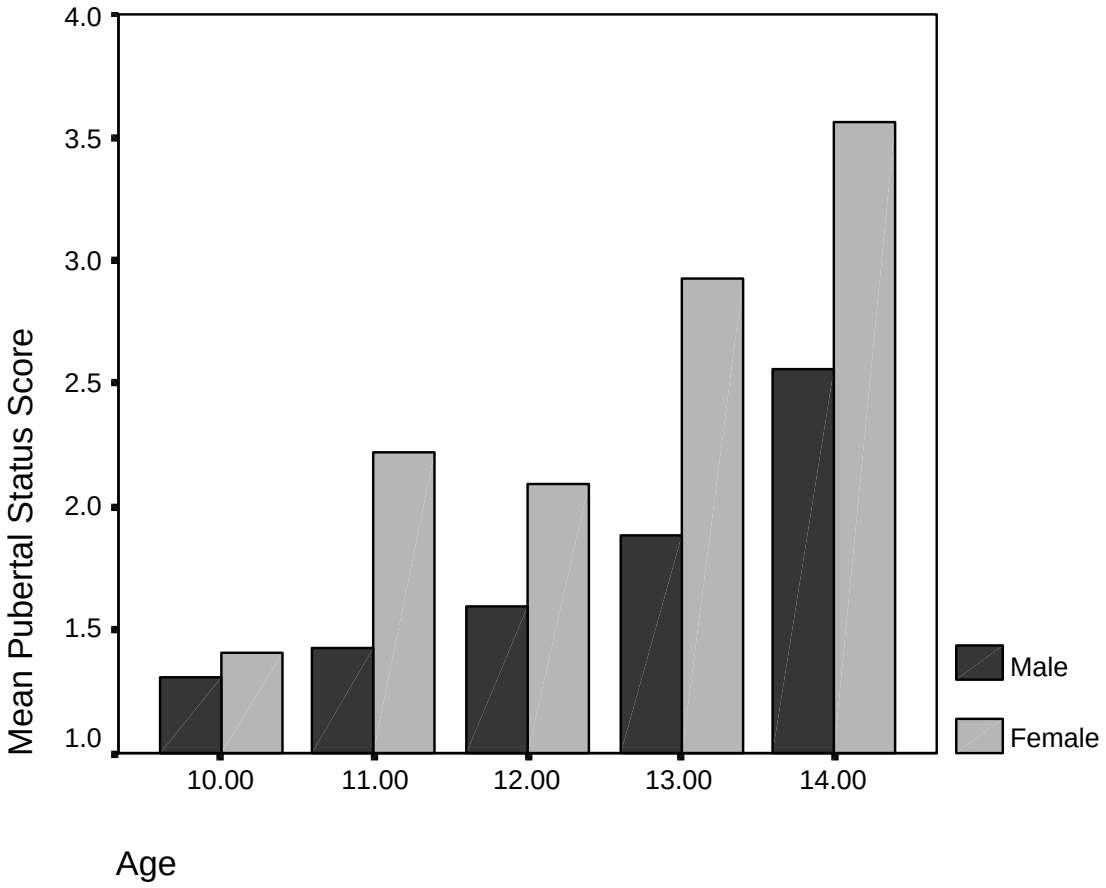


FIGURE 1. Mean Puberty Category by Age and Gender.

were scores for females (r = .89, p < .001). Paired samples t tests within gender were conducted to examine mean level differences between raters; male self-report scores (M = 1.83, SD = .62) were significantly higher than were parent-report scores (M = 1.53, SD = .61; $t(70)$ = -4.81, p < .001). For females, self-report scores (M = 2.39, SD = .90) were significantly lower than parent-report scores (M = 2.54, SD = .87; $t(74)$ = 3.07, p < .01).



Note: Male and female pubertal status scores are calculated differently and cannot be compared across genders.

Linear trend across ages: Male: p < .001; Female: p < .001.

FIGURE 2. Mean Pubertal Status Score by Age and Gender.

Temperament and Puberty

Due to the uneven cell sizes in puberty category scores by gender, it was not possible to examine possible puberty category by gender interactions in temperament scores via the use of ANOVA. Instead, pubertal status scores were standardized within gender and an interaction term was created for use in regression. Significant puberty by gender interactions were found for self-report Surgency ($\beta = .31$, $t = 2.03$, $p < .05$) and, at the level of a trend, for parent-report Affiliation ($\beta = .28$, $t = 1.85$, $p = .066$) and Surgency ($\beta = .30$, $t = 1.95$, $p = .053$). The poor range of pubertal scores in males made examination of changes across puberty in males somewhat more difficult and less reliable than similar examination in females; thus analyses were conducted by gender and are reported as such.

Puberty Categories

A series of one-way ANOVA analyses with planned linear contrasts were performed within gender to determine possible differences in temperament scores as a function of pubertal stage scores. For females, prepubertal participants were not included due to small cell size ($n = 4$); late pubertal males were similarly not included due to small cell size ($n = 3$). No significant findings were revealed for males; however, female participants showed a decrease in Effortful Control across puberty at near trend level ($F(2, 69) = 2.29$, $p = .11$) with a significant linear trend ($F(1, 69) = 4.59$, $p < .05$) and is presented in Figure 3 as standardized (z) scores, rather than raw scores. Examination of Effortful Control subscales revealed that Activation Control declined significantly ($F(2,$

69) = 7.16, $p < .01$, linear trend $F(1, 69) = 12.60$, $p < .01$) across puberty, and Inhibitory Control declined at near trend level ($F(2, 69) = 2.21$, $p = .12$, linear trend $F(1, 69) = 3.26$, $p = .08$). Attention did not show a significant decline (See Figure 4 for illustration of standardized scores).

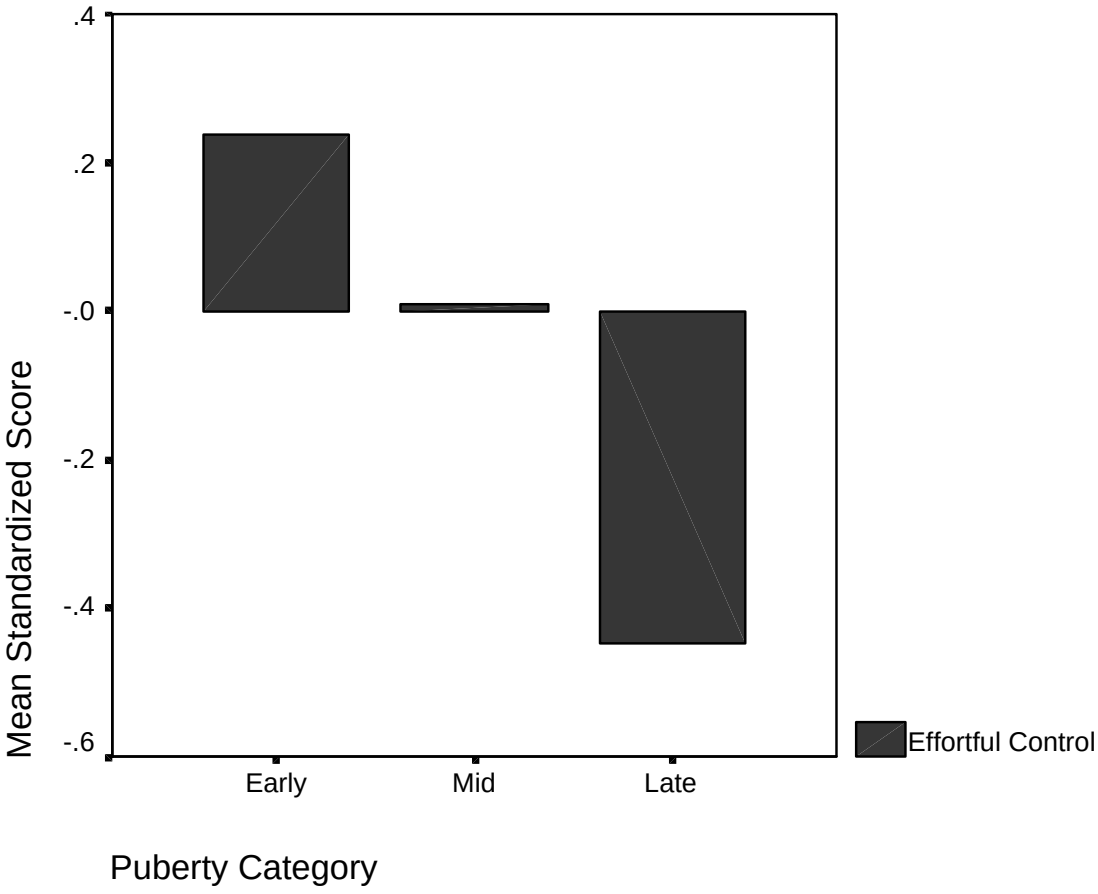
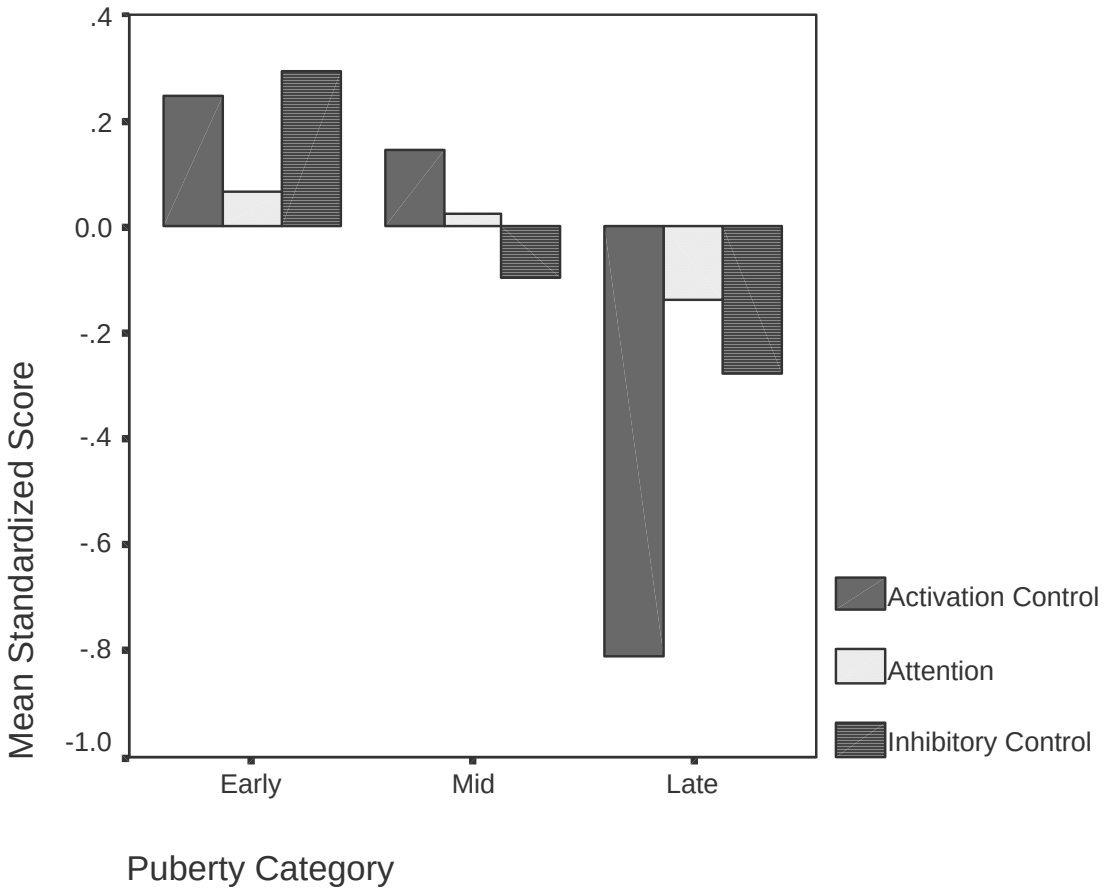
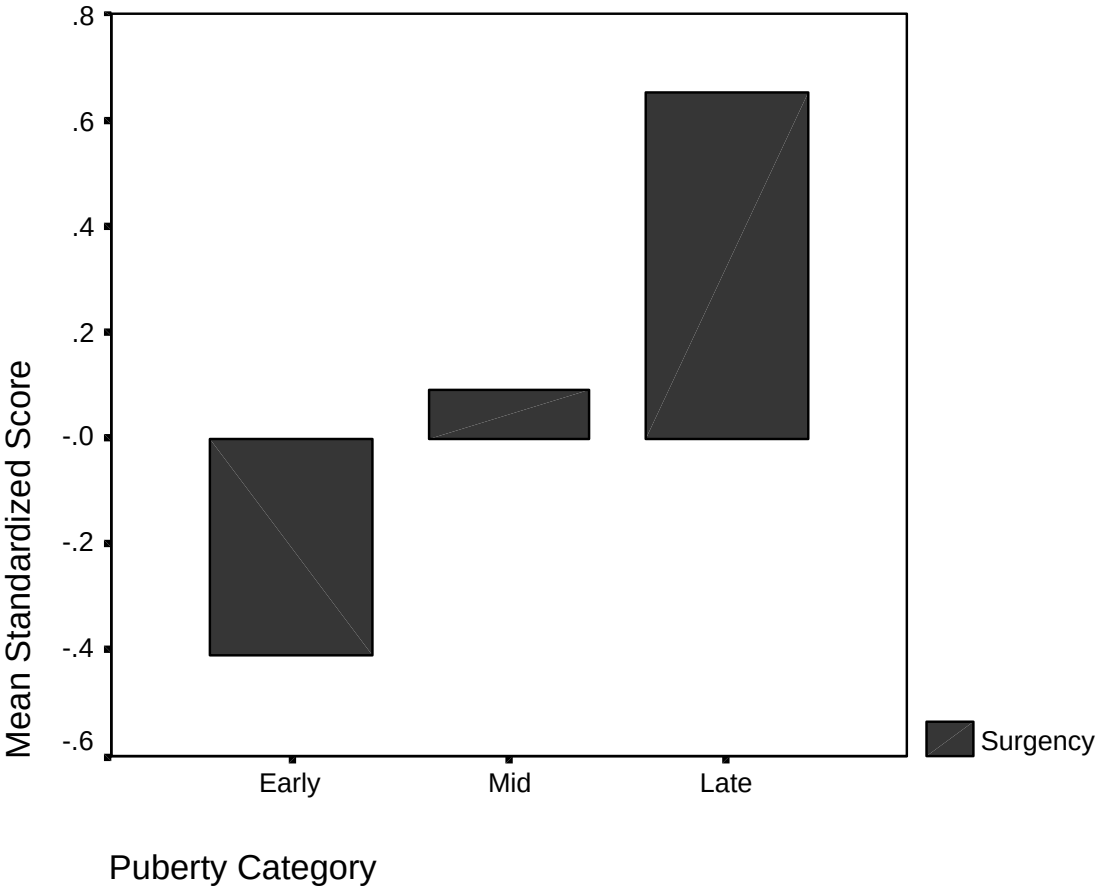


FIGURE 3. Female Standardized Effortful Control Scale Scores by Pubertal Status Group



One-way ANOVA
Activation Control, $p < .01$; Inhibitory Control, $p = .12$

FIGURE 4. Female Standardized Effortful Control Subscale Scores by Pubertal Status Group



One-way ANOVA, $p < .01$

FIGURE 5. Female Standardized Surgency Scale Scores by Pubertal Status Group

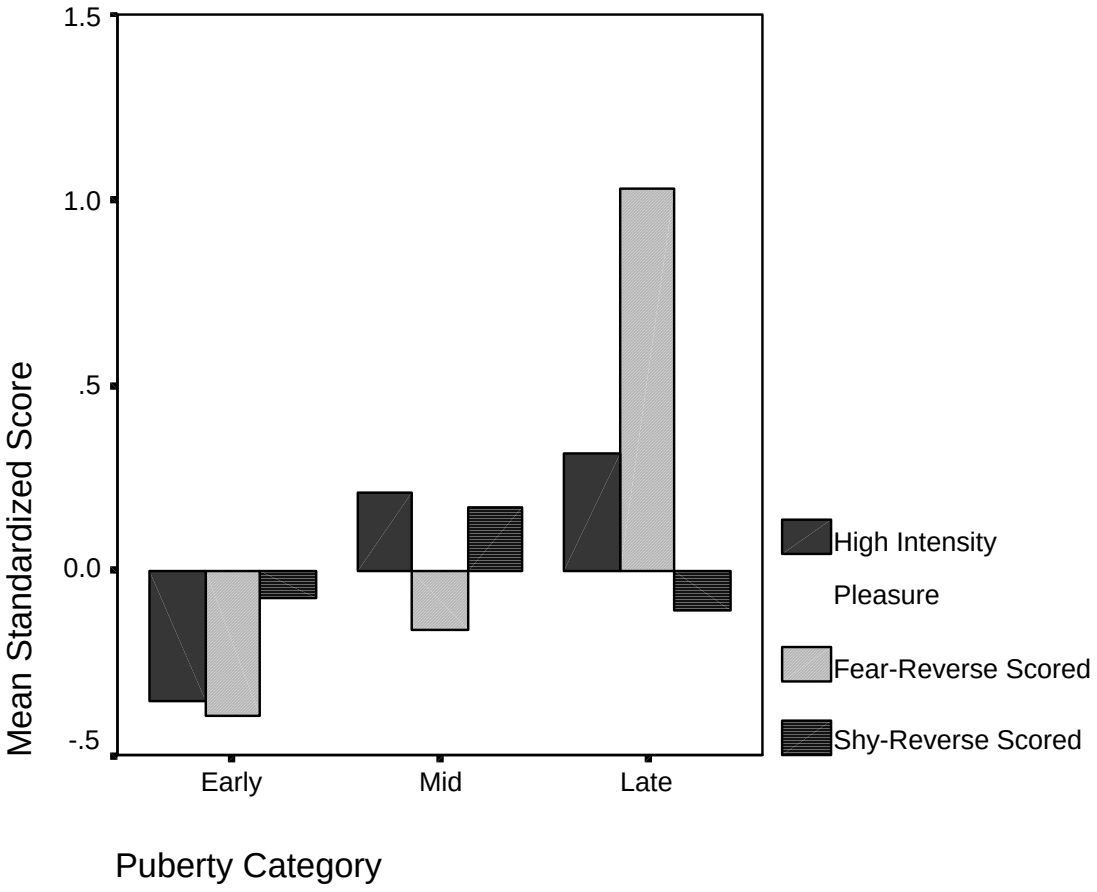
Surgency scale scores increased significantly across puberty ($F(2, 69) = 6.58$, $p < .01$, linear trend $F(1, 69) = 12.90$, $p < .01$, see Figure 5 for illustration of standardized scores). Examination of Surgency subscales revealed a significant decrease in Fear ($F(2, 69) = 15.70$, $p < .001$, linear trend $F(1, 69) = 30.28$, $p < .001$), and an increase in High Intensity Pleasure at trend level ($F(2, 69) = 2.76$, $p = .07$, linear trend $F(1, 69) = 4.47$, $p < .05$). Shyness did not show a significant decline (See Figure 6 for illustration of standardized scores). Identical statistical tests were performed using mother-report temperament scores as the dependent variable; no significant results were found.

Menarcheal Status

Female participants were coded as to menarcheal status. Forty-nine participants had not reached menses; 27 had. Independent samples *t* tests revealed that females who had reached menses reported themselves as significantly lower in Activation Control ($M = 3.34$, $SD = .74$) than girls who had not ($M = 3.84$, $SD = .70$, $t(74) = 2.90$, $p < .01$). In addition, they reported lower scores on Fear (Post Menses: $M = 2.42$, $SD = .63$; Pre-Menses: $M = 3.12$, $SD = .63$, $t(74) = 4.92$, $p < .001$), and higher High Intensity Pleasure scores (Post Menses: $M = 3.42$, $SD = .77$; Pre-Menses: $M = 2.98$, $SD = .77$, $t(74) = -2.37$, $p < .05$). Thus, overall Surgency scores were higher for girls who had reached menses (Post Menses: $M = 3.56$, $SD = .57$; Pre-Menses: $M = 3.14$, $SD = .50$, $t(74) = -3.33$, $p < .01$).

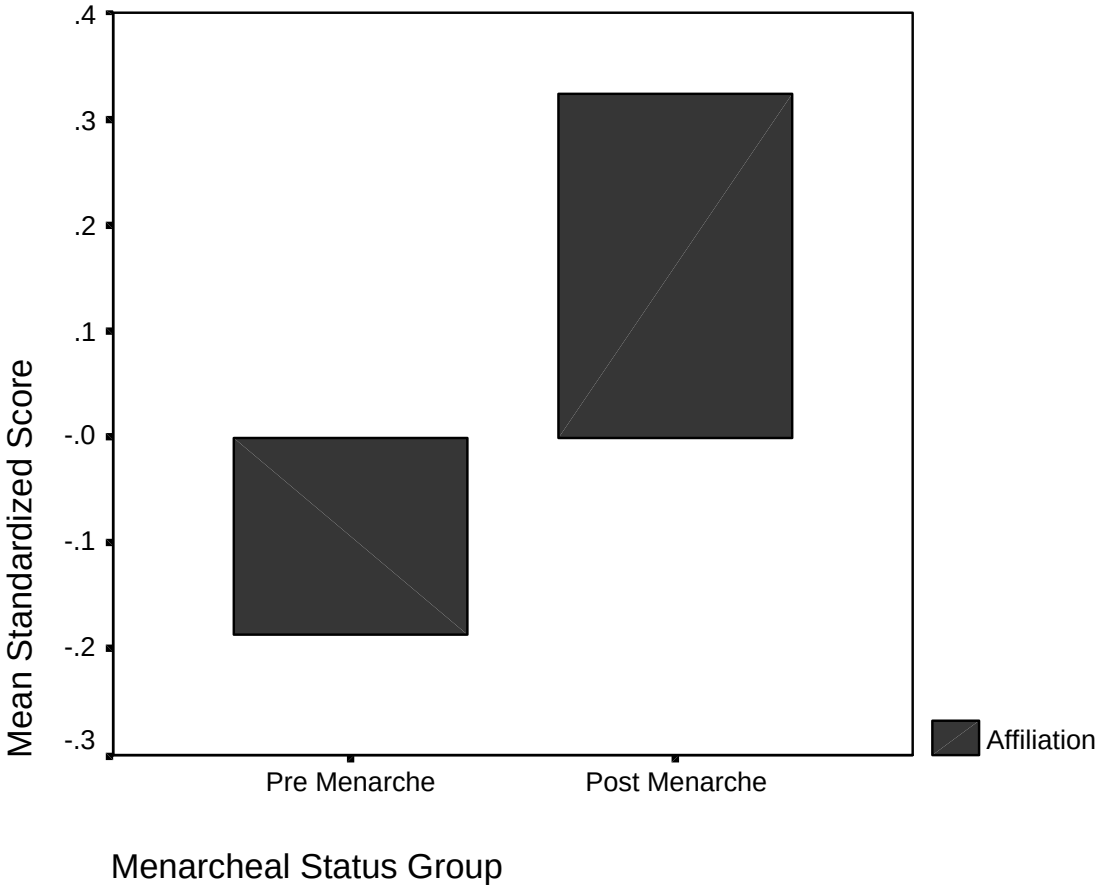
A significant difference also existed for self-reported Affiliation (see Figure 7). Females who had reached menses reported higher Affiliation scores than those who had not (Post Menses: $M = 4.20$, $SD = .55$; Pre-Menses: $M = 3.85$, $SD = .64$, $t(74) = -2.44$, $p <$

.01). In addition, mother-report scores on Activation Control were significantly lower for females who had reached menses than for those who had not (Post Menses: $M = 2.42$, $SD = .63$; Pre-Menses: M=3.12, SD=.63, t(74)=4.92, p<.001).



One-way ANOVA
Fear, $p < .001$; High Intensity Pleasure, $p = .07$.

FIGURE 6. Female Standardized Surgency Subscale Scores by Pubertal Status Group



Independent Samples *t* test; $p < .01$.

FIGURE 7. Female Standardized Affiliation Scale Scores by Menarcheal Status

Pubertal Status Score, Age, and Temperament

Because age and puberty scores were highly correlated (age and puberty group: $r = .62$, $p < .001$, age and pubertal status score: $r = .82$, $< .001$), a series of zero order and partial correlations were conducted between temperament scores and the continuous

pubertal status score and age variables. Self- and parent-report scores are summarized in Tables 7-8 (female) and 9-10 (male). Results are summarized below by scale.

TABLE 7. Zero Order Pearson's Correlations and Partial Correlations
Self-Report Temperament, Females

	Pubertal Score	*Age*	*Puberty Controlling for Age*	*Age Controlling for Puberty*
Effortful Control	**-.27***	-.10	**-.26***	.12
Activation Control	**-.35****	**-.30****	**-.21+**	-.07
Attention	-.07	.15	**-.20+**	**.25***
Inhibitory Control	**-.21+**	-.03	**-.24***	.12
Affiliativeness	.10	**.19+**	-.07	**.20+**
Affiliation	**.24***	**.21+**	.07	.12
Perceptual Sensitivity	-.08	-.03	-.08	.03
Pleasure Sensitivity	.09	**.24***	-.12	**.26***
Negative Affectivity	.14	-.02	.16	-.12
Aggression	.16	.05	.13	-.05
Depressive Mood	**.27***	.10	**.22+**	-.08
Frustration	-.09	-.18	.02	-.15
Surgency	**.38****	**.41****	.11	**.24***
Fear	**-.44****	**-.47****	**-.21+**	**-.24***
High Intensity Pleasure	**.37****	**.37****	.13	**.22+**
Shyness	-.06	-.06	.05	-.08

+ $p < .10$, * $p < .05$, ** $p < .01$.

TABLE 8. Zero Order Pearson's Correlations and Partial Correlations
Parent-Report Temperament, Females

	Pubertal Group	*Age*	*Puberty Controlling for Age*	*Age Controlling for Puberty*
Affiliation	-.01	-.12	.09	-.15
Effortful Control	-.16	.10	**-.24***	**.24***
Activation Control	**-.21+**	.02	**-.23***	.17
Attention	-.03	.14	-.13	.18
Inhibitory Control	-.16	.10	**-.26***	**.25***
Negative Affectivity	.06	-.05	.16	-.11
Aggression	.13	.05	**.22+**	-.04
Depressive Mood	-.01	-.02	-.01	-.02
Frustration	.02	-.15	**.22+**	-.21
Surgency	.17	.17	.11	.08
Fear	-.03	**-.27***	.19	**-.30****
High Intensity Pleasure	**.20+**	.16	.17	.05
Shyness	-.12	.02	**-.20+**	.13

+ $p < .10$, * $p < .05$, ** $p < .01$.

TABLE 9. Zero Order Pearson's Correlations and Partial Correlations
Self-Report Temperament, Males

	Pubertal Group	*Age*	*Puberty Controlling for Age*	*Age Controlling for Puberty*
Effortful Control	-.03	-.11	.06	-.12
Activation Control	-.13	**-.23+**	.04	-.19
Attention	.05	.05	.03	.02
Inhibitory Control	.04	-.03	.09	-.07
Affiliativeness	.14	**.19+**	.02	-.12
Affiliation	**-.**09	-.14	-.10	.04
Perceptual Sensitivity	.12	-.20	**.36****	**-.39****
Pleasure Sensitivity	-.19	-.08	-.19	.08
Negative Affectivity	.19	.12	.15	-.02
Aggression	.14	.05	.08	.03
Depressive Mood	**.23+**	.12	**.20+**	-.05
Frustration	.04	.13	.05	-.03
Surgency	-.05	.00	-.07	.05
Fear	.11	-.06	-.01	-.04
High Intensity Pleasure	-.04	.01	-.06	.05
Shyness	.08	.04	.07	-.02

+ $p < .10$, * $p < .05$, ** $p < .01$.

TABLE 10. Zero Order Pearson's Correlations and Partial Correlations
Parent-Report Temperament - Males

	Pubertal Group	*Age*	*Puberty Controlling for Age*	*Age Controlling for Puberty*
Affiliation	**-.23***	**-.22+**	-.11	-.08
Effortful Control	-.03	.01	-.05	.05
Activation Control	-.07	-.08	-.05	.01
Attention	-.03	.02	-.06	.05
Inhibitory Control	.05	.10	-.01	.07
Negative Affectivity	.19	.14	.15	-.02
Aggression	.09	.10	.02	.08
Depressive Mood	.09	.12	.02	.06
Frustration	.07	.13	-.04	.13
Surgency	-.14	-.04	-.15	.07
Fear	-.07	-.08	-.00	-.07
High Intensity Pleasure	-.06	-.01	-.08	.04
Shyness	**.24***	.12	**.20+**	-.04

+ $p < .10$, * $p < .05$, ** $p < .01$.

Effortful Control

For females, a significant negative relationship was found between Effortful Control and pubertal status score. This relationship remained significant after controlling for the effects of age. Activation Control was negatively related to both pubertal status and age, but only the relationship with pubertal status remained significant (at trend level) after controlling for age. In addition, the negative relationship between Inhibitory Control and pubertal status strengthened from trend level to significance when controlling for age, and partial correlations revealed a negative relationship between Attention and pubertal status, along with a positive relationship between Attention and age.

While parent-report of female Effortful Control showed no significant zero order relationship with either pubertal status or age, partial correlations revealed a negative relationship with pubertal status and a positive relationship with age. A similar pattern of findings was present for Inhibitory Control, while Activation Control was negatively related to pubertal status at trend level (zero order correlations) and significantly so after controlling for puberty.

For males, Activation Control was negatively related to age at trend level, but this relationship dropped to a less than significant level after controlling for pubertal status. There were no significant relationships between parent-report of male Effortful Control and puberty or age.

Affiliativeness

In females, Affiliativeness was associated with age at trend level in both full and partial correlations, while the Affiliation subscale was associated with both pubertal status and age in full, but not partial, correlations. Pleasure Sensitivity was associated with age across both types of correlations. There were no significant relations between parent report Affiliation, age, and puberty for females.

In males, self-report Affiliativeness showed a positive relationship at trend level with age, but not after controlling for puberty. Perceptual Sensitivity showed a positive partial correlation with age, and a negative partial correlation with puberty. For male parent-report temperament, Affiliation was negatively related to both puberty and age, but neither relationship was significant after controlling for the other.

Negative Affectivity

In females, self-report Depressive Mood showed a positive relationship with pubertal status that dropped to trend level when controlling for age; no other self-report Negative Affectivity subscale scores were related to pubertal status or age. Parent-report Aggression and Depression in females were both positively related to pubertal status at trend level after controlling for age.

For males, self-report Depressive Mood was positively related to pubertal status at trend level, both for zero order and partial correlations. There were no significant relations between parent-reported Negative Affectivity in males and age or puberty.

Surgency

In females, zero order correlations with Surgency were significant for both pubertal status and age; only the relationship with age remained significant after controlling for pubertal status. Fear was negatively related to both pubertal status and age; both relationships remained significant after controlling for the other. High Intensity Pleasure was positively related to both, but only the relationship with age remained significant after performing partial correlations.

Parent-report of female Fear subscale was negatively related to age (both zero order and partial correlations), while High Intensity Pleasure was related to pubertal status at trend level, but only for the zero order correlation. Shyness was negatively related at trend level to pubertal status, but only for the partial correlation.

In male self-report, Shyness was positively related to puberty, but dropped to trend level after controlling for age. No significant relationships were present for parent-report Surgency scales or subscales for males.

Temperament, Puberty and Socio-Emotional Behaviors

To determine possible roles of temperamental and pubertal processes in socio-emotional behaviors, separate regression analyses were performed to predict Depressive Mood and Aggression. In each regression, predictors were entered simultaneously. Effortful Control, Surgency, and Affiliativeness scale scores, as well as Frustration and Aggression subscale scores, were entered as temperament variables to predict Depressive Mood. In addition, gender, age, and pubertal status score were also entered. For

Aggression, predictors included Effortful Control, Surgency, and Affiliativeness scale scores, Frustration and Depressive Mood subscale scores, and gender, age, and pubertal status score.

The full model predicting Depressive Mood was significant ($F(8, 137) = 12.53$, $p < .001$, $R^2 = .42$; see Table 11). Examination of standardized Betas revealed that Effortful Control (β = -.38, $t = -4.72$, $p < .001$); Surgency (β = -.29, $t = -4.715$, $p < .001$); Pubertal Status (β = .27, $t = 2.91$, $p < .01$); Frustration (β = .18, $t = 2.51$, $p < .05$); and Affiliativeness (β = .14, $t = 1.98$, $p = .05$) all contributed significantly to prediction of Depressive Mood scores. The direction of the relationships indicated that lower levels of Effortful Control and Surgency, higher Frustration and Affiliativeness, and more advanced pubertal status all predicted significant variance in Depressive Mood scores.

TABLE 11. Regression Analysis to Predict Depressive Mood
Study 1

	Beta	*t*	*Sig.*
Gender	.00	.02	.982
Effortful Control	**-.38**	**-4.72**	**.000**
Affiliativeness	**.14**	**1.98**	**.050**
Surgency	**-.30**	**-4.27**	**.000**
Aggression	.02	.20	.843
Frustration	**.18**	**2.51**	**.013**
Pubertal Score	**.27**	**2.91**	**.004**
Age	-.02	-.18	.861

$R^2 = .42$, $p < .001$

Because age and pubertal status scores were highly correlated, the inclusion of both as predictors led to possible problems with collinearity and resulting instability of coefficients. Thus, subjects were randomly split into two groups, and the regression was conducted separately for each group. For Group 1, pubertal status again predicted Depressive Mood (β = .46, t = 3.07, p < .01), while age did not (β = -.14, t = -1.18, p = .24). For Group 2, pubertal status was positively related to Depressive Mood, although not significantly so (β = .25, t = 1.45, p = .15), while age, again, was not (β = -.13, t = -86, p = .40).

The full model predicting Aggression was also significant (F(8, 137) = 11.96, p < .001, R^2 = .41; see Table 12). Examination of standardized Betas revealed that Effortful Control (β = -.47, t = -5.95, p < .001), Gender (β = -.22, t = -3.06, p < .01), and

TABLE 12. Regression Analysis to Predict Aggression
Study 1

	Beta	*t*	*Sig.*
Gender[1]	**-.22**	**-3.06**	**.000**
Effortful Control	**-.47**	**-5.95**	**.000**
Affiliativeness	-.05	-.67	.521
Surgency	.04	.53	.592
Depressive Mood	.02	.20	.843
Frustration	**.18**	**2.36**	**.019**
Pubertal Score	.09	.92	.357
Age	-.01	-.07	.946

[1]Males are coded as 0, females as 1
R^2 = .41, p < .001.

Frustration ($\beta = .18$, $t = 2.36$, $p < .05$) all contributed significantly to the model. The direction of the relationships indicated that lower levels of Effortful Control, higher levels of Frustration, and gender (male) all predicted significant variance in Aggression scores. As neither age nor pubertal status predicted Aggression scores, additional analyses by groups were not conducted.

Discussion

The primary goals of the current study were two-fold; first, to explore the hypothesis that emotional reactivity, as measured by the EATQ-R, would increase as a function of pubertal maturation; and second, to explore the relative contributions of temperament and pubertal maturation to aggression and depressive mood. Study 1 also afforded an opportunity for further examination of psychometric properties of the EATQ-R, particularly with regard to internal reliability, the relationship between scales, and agreement between raters. Each of these goals will be discussed.

Psychometric Properties of the EATQ-R

In a previous study (Ellis & Rothbart, 2002) we found the EATQ-R to have good internal reliability, relationships between scales that were similar to those found in studies of child temperament, and modest agreement between self- and parent-report. One goal of the current study was replication of those findings.

In general, internal reliability of EATQ-R scales proved to be satisfactory in the current study. Scale and subscale reliabilities were relatively comparable to those from the original study, with the exception of the Inhibitory Control subscale. In the original

EATQ-R study, co-efficient alpha for Inhibitory Control was .65; in the current study, co-efficient alpha was .56.

The Inhibitory Control subscale contains only five items; Petersen et al., (Petersen, Crockett, Richards et al., 1988) assert that a five-item scale with reliability of .77 corresponds to an alpha of .88 for a tem-item scale. Further, subscale reliability estimates in the current study are comparable to those obtained for self-report NEO-FFI (NEO-Five Factor Inventory) scales in a cross-cultural study of adolescent personality (McCrae et al., 2000). Internal consistencies of 12 item NEO-FFI personality scales ranged from .57 - .86 in adolescents, while EATQ-R subscale reliabilities in the current study ranged from .52 - .79. In addition, inter-item correlations for subscales averaged > .30. Nonetheless, the alpha level is such that additional work may be warranted on the Inhibitory Control subscale. Further, it is suggested that subscales not be separated from their "parent" scales in subsequent studies.

Agreement between reporters was also an issue of great interest in the current set of studies. Parent report of temperament has been criticized by some as being biased and inaccurate (see Rothbart & Bates, 1998, for a complete discussion) but parents may, in fact, "be in a good position to observe the child's behavior, especially infrequently occurring behavior that is nevertheless critical to defining a particular dimension of temperament" (Rothbart & Bates, 1998, p. 121). Likewise, self-report may also be viewed as reflecting bias, particularly if responses tend to follow patterns of social acceptability. However, to the extent that we can assume that adolescents respond with some degree of honesty when asked about their behavioral tendencies, their self-perceptions are as important as the perceptions of other reporters, particularly with regard

to more internal processes such as emotions. As such, parent- and self-report data were collected for each participant, allowing for comparison between reporters.

Parent/self agreement for Study 1 was generally higher than would have been predicted by previous studies (Capaldi & Rothbart, 1992; Ellis & Rothbart, 2002). In a 1992 study utilizing the original EATQ, Capaldi and Rothbart reported agreement levels with genders combined that ranged from -.05 through .70, averaging .24. In our previous study using the EATQ-R, we found agreement levels with genders combined of .05 through.74, averaging .32 (Ellis & Rothbart, 2002). Agreement in the current study ranged from .29 through .53 and averaged .40. However, the mean age of the participants in the current study was younger than in the two previously cited studies. Achenbach, McConaughy, and Howell (1987) report that agreement between reporters of behavioral and mental health problems, including parent/self agreement, is significantly higher for 6- to 11-year-olds than for older adolescents.

Examination of areas of agreement and disagreement between reporters revealed an interesting finding regarding Frustration. Items in both self- and parent-report ask about irritability and frustration in the face of goal blocking. While parent/self Frustration ratings in Study 1 showed moderate agreement (.30), adolescent participants consistently reported themselves higher in Frustration than did their parent. This finding suggests that adolescent participants were not necessarily reporting their behaviors in a direction one might consider socially desirable. However, it is important to note that Study 1 participants also consistently reported themselves as higher in Effortful Control and its subscales than did their parents.

Further differences were found upon examination of patterns of relationships between scales. While parents' reports of Surgency and Affiliation were significantly positively correlated (.27), this was not the case in self-report (.13), although the relationship was in the same direction. This suggests that observable behaviors viewed as Affiliative may be quite different from Affiliative feelings and desires. Parents may view extraverted behaviors as being Affiliative, thus linking such behaviors to Surgency, while adolescents may view Affiliative feelings as something different from extraverted behaviors. In addition, parent-report Surgency in this sample was modestly positively related to Effortful Control and negatively related to Aggression. Neither of these relationships was present for self-report.

Overall, although there were some areas of disagreement between reporters, agreement was higher than had been expected. However, areas of disagreement may provide as much information as do areas of agreement, as in the case of Affiliation. Achenbach et al. (1987) suggest that "each type of informant typically contributes a considerable amount of variance not accounted for by the others" (p. 227). Jensen et al. (1999) further suggest that both parent and child informants are necessary to obtain accurate and adequate information for diagnosis of clinical conditions; this suggestion may be equally valid with regard to the measurement of adolescent temperament.

Temperament, Puberty, and Age

It has been suggested that underlying neurological changes associated with the onset of puberty cause an increase in emotional reactivity that may lead to possible maladaptive outcomes (e.g., Dahl, 2001; Spear, 2000; Walker, 2002). Others have

suggested that it is not puberty per se, but rather pubertal timing, which plays a role in psychosocial development (e.g., Graber, 1997; Stattin, 1990). Indeed, there is empirical evidence to support both of these viewpoints (see Buchanan et al., 1992, for a review). However, the current study focused on pubertal maturation rather than pubertal timing because the high degree of interdependence between the two during early adolescence makes it difficult to assess independent contributions of each. Further, the present study tested the hypothesis that physiological changes associated with puberty would affect physiologically based temperament systems. Specifically, it was hypothesized that Negative Affectivity, Surgency, and in females, Affiliativeness, would increase across puberty, leading to increased emotionality.

To test for effects of pubertal maturation, one must also consider the role of age. While individuals differ in the timing and rate of pubertal development, there is still a strong, positive relationship with age. Social transitions, such as the move from elementary- to middle-school are also closely tied to age; therefore, while the current study could not effectively control for social transitions, we did control for the effects of age. Thus, each finding is discussed with regard to both age and pubertal maturation.

The primary hypotheses were partially supported. Levels of self-reported Surgency in females did, indeed, increase significantly across puberty, driven to some degree by an increase in High Intensity Pleasure, but to a greater degree by a decrease in Fear levels. Partial correlations revealed the increase in High Intensity Pleasure to be more closely related to age than to pubertal maturation; however, the decrease in Fear was related to both age and pubertal maturation. This suggests that, as females mature, they are less fearful and more apt to endorse items measuring high intensity pleasure.

Further, even when controlling for age differences in Fear levels, girls of advanced pubertal maturation were less fearful than were their less pubertally advanced age-mates. It is important to note, however, that parent-report female Fear was negatively associated with age, but not with pubertal maturation. Further, there was no relationship between age, puberty, and self- or parent-report Fear in males.

Levels of overall self- and parent-report Negative Affectivity did not increase with pubertal status; however, there was an increase in self-reported Depressive Mood with increased pubertal status in both males and females; this relationship remained significant even after controlling for the effects of age. Interestingly, after controlling for age, parent-report female Frustration and Aggression were also positively related to pubertal maturation, as had been hypothesized. This finding suggests that Negative Affectivity in adolescent girls may be more closely associated to pubertal maturation than to the changes that accompany age. However, given the inconsistency of findings from previous studies with regard to puberty and negative affect, this finding needs to be replicated. Further, the age range studied did not allow for sufficient variance in male pubertal status to fully test for a role of pubertal maturation in changes in temperament. An additional note of caution is warranted with regard to the partial correlations reported. Age and pubertal status were highly correlated; thus, the partial correlations may have been affected by issues of collinearity and instability of coefficients.

Female Affiliativeness did not show a linear relationship with pubertal maturation as hypothesized; however, there was a significant increase in Affiliativeness with the onset of menarche. This increase is consistent with the theory that affiliative behaviors may be related to pubertal activation of the neuropeptide oxytocin.

One of the most surprising findings in the current study was the decrease in both self- and parent-report female Effortful Control across pubertal maturation. The decrease in Activation Control can be viewed as consistent with previous research showing a decrease in energy across pubertal maturation (see Buchanan et al., 1992, for a review), as most Activation Control items involve performing some sort of action. However, decreases in Attention and Inhibitory Control were less expected.

Our model of temperament is based in physiology; indeed, we believe that Effortful Control is related to functioning of frontal areas of the brain. As reported in the introduction, laboratory studies suggest that performance on laboratory tasks purportedly involving frontal areas increases across adolescence (Davies & Rose, 1999; Levin et al., 1991). Further, neuro-imaging studies suggest that significant maturation of brain areas involved in executive functioning occurs during the adolescent period (e.g., Giedd, 1996; Klingberg, 1999; Paus, 1999; Sowell, 1998, 1999). If Effortful Control is related to functioning of the executive system, we might expect it to increase during adolescence. In the current study, however, the opposite was true, at least with respect to puberty after controlling for age. However, when controlling for the effects of puberty, parent-report Effortful Control increased with age as one might predict from studies of brain maturation.

A concurrent decrease in Effortful Control and Fear, both of which are considered in our model to serve regulatory purposes, is both intriguing and perplexing. However, it may be that increased physical maturation brings with it a decreased desire to present oneself as childlike and compliant. Many of the Effortful Control items ask about behaviors, such as completing assignments and regulating impulsive behaviors, which

would be considered compliant. Further, many of the Fear items are associated with fears and concerns that may be viewed as childlike by adolescents. Thus, the pattern of responses may reflect changing attitudes toward compliance rather than changing temperaments. Intuitively it seems reasonable to expect that such attitude change would also be associated with increasing age. This was not the case in the current study.

Alternatively, while the focus of the current study is on pubertal status, the findings may actually reflect the effects of pubertal timing. By definition, many of the girls who are most pubertally advanced in the current study are also earlier maturing as compared to their age-mates. It is not until the age of 14 or 15 that one can be reasonably sure that nearly all females are of equal pubertal status. Thus, perhaps the current findings reflect attitudes toward compliance developed as a response to pressures and difficulties associated with early puberty. The design of the current study does not allow exploration of this hypothesis.

A third explanation may relate, in part, to Spears' (2000) evolutionary theory of adolescent development. Based on animal studies that show increased exploration of novelty during adolescence, Spears has suggested that changes in the adolescent brain important to frontal development, including increases in dopamine and decreases in glutamate and GABA in frontal areas, as well as changes in dopamine activity in limbic areas, may cause temporary alterations in the incentive value of stimuli such as drugs and social interactions. Perhaps these brain changes in adolescence cause some sort of temporary perturbation of regulatory systems, resulting in increased dysregulation of behavior and emotion. While such theories are intriguing, a great deal of empirical work remains to be done in the area of adolescent brain development before we can suggest

that general patterns of adolescent behavior reflect general patterns of adolescent brain development. It is, however, a potentially exciting area of study.

Temperament, Puberty, and Psychosocial Behaviors

The results of regression analyses to predict psychosocial behaviors in Study 1 were generally consistent with expected results and with our previous study utilizing the EATQ-R (Ellis, 2002). Low Effortful Control predicted the largest amount of variance in Depressive Mood scores, while low Surgency, high Affiliativeness, and Frustration, as well as increased pubertal maturation, also contributed. Effortful Control may give an individual the ability to turn away from negative emotion, thus preventing the "rumination" often seen in depression (Nolen-Hoeksema & Girgus, 1994). Alternatively, depression may erode an individual's ability to control action and emotion. The design of the current study does not allow us to determine directionality. Likewise, the inverse relationship between Surgency and Depressive Mood may reflect a decrease in interest in activities and an increase in fear as symptoms of depression, or engagement in social activities may contribute to the onset of depression.

Gender did not play a role in Depressive Mood in this sample, even though the majority of studies, including the original EATQ-R study, have found significant gender differences in depression. However, most studies agree that gender differences in depression do not emerge until later adolescence (Nolen-Hoeksema & Girgus, 1994; Petersen, et al., 1988). The relation between Depressive Mood and Affiliativeness was also present in the original EATQ-R study (Ellis, 2002). Frank and Young (2000)

hypothesize that an increase in biologically driven affiliative needs in adolescent females results in increased salience of relationship quality. Thus, relationship difficulties are more stressful for females than for males, resulting in increased depression in females. Indeed, empirical evidence suggests that relationship difficulties are associated with depression in adolescent females (Nolen-Hoeksema & Girgus, 1994). We might expect, then, that the relationship between Affiliativeness and Depressive Mood would be mediated by relationship issues. The current study did not measure such variables, and therefore cannot test for mediation effects. However, Frank and Young's theory (2000) would also account for the role of pubertal maturation in Depressive Mood.

Alternatively, the relationship between the two variables may reflect the role of loneliness in Depressive Mood. Because the Affiliation scale asks about desires for affiliative experiences, rather than the actual presence of such experiences, high scores may indicate unfulfilled affiliative needs rather than the actual presence of a relatively high level of affiliative behaviors. Future research on this issue will need to include relationship variables to understand fully the role of Affiliativeness in adolescent depression.

Effortful Control also showed a strong, negative relationship with Aggression, as found in a number of other studies (e.g., Eisenberg, 2001; Ellis, 2002; Rothbart, 1994). Frustration and gender (e.g., being male) also played a role. In our previous study, Affiliativeness was negatively related to Aggression; this was not the case for this sample. Further, Surgency was related to Aggression in our previous study; again, this was not the case in our current study. However, the effect sizes of Surgency and Affiliativeness in the previous study were quite small compared to Effortful Control. We

did not find a difference in gender in the previous study, but this may have been due to the older nature of the sample (mean age = 13.78 years), consistent with the finding that gender differences in aggression disappear by late adolescence (Finkelstein et al., 1994).

In sum, Study 1 provided at least partial support for our original hypotheses. While there was some indication of an increase in Depressive Mood with increasing pubertal maturation, intriguing evidence emerged that suggests that pubertal maturation may contribute to a decrease in both passive and active regulation systems. However, the effect size of the relationship was modest and needs replication. In addition, the study partially replicated our previous findings regarding the role of temperament in psychosocial behaviors. Most notable was the contribution of poor Effortful Control to both Depressive Mood and Aggression, underscoring the importance of Effortful Control to healthy adolescent psychosocial development. In addition, we replicated our previous finding regarding a relationship between Affiliativeness and Depression. Finally, we obtained evidence of adequate internal reliability of the EATQ-R self- and parent-report forms in a group of relatively young participants. In addition, agreement between reporters was generally higher than had been expected, suggesting that adolescent and parent participants in this age group tend to be in agreement with regard to general patterns of behavior in the adolescent.

It is important to note that the adolescent participants in Study 1 represented a fairly homogenous group of late elementary- and early middle-school students in a primarily European-American middle-class community. In this respect, the findings with regard to temperament and socio-emotional behaviors and the psychometric properties of

the EATQ-R could be expected to be similar to those obtained in our original study, as the participants were drawn from primarily the same demographic.

However, we felt it was important to replicate and extend our findings to an older, more diverse group of adolescents. The majority of participants in Study 1 were young enough that it would be unlikely that many had started to participate in truly "anti-social" behaviors. However, the study of Effortful Control in problem behaviors provided much of the impetus for revision of the EATQ-R. Thus, it was important to study a population in which a certain percent were likely to be engaging in such behaviors. Additionally, while risk and parenting variables were not assessed in Study 1, it was assumed that the majority of participants were from relatively low-risk environments; therefore, we could not examine the role of temperament in socio-emotional behaviors within the context of such variables.

An additional area of interest not addressed in Study 1 was the relationship, if any, between performance on executive attention measures and self- and parent-report Effortful Control. As outlined in the introduction, our laboratory has found a positive relationship between performance on such tasks and Effortful Control in both toddlers (Gerardi-Caulton, 200**X**; Rothbart et al., 2002), and adults (D. Evans, personal communication, May 13, 2001). However, because Study 1 was conducted entirely via the mail, it was not feasible to assess attention within the confines of such a study.

We were very fortunate to have access to a subsample of participants currently involved in a longitudinal intervention study. The participants are of high-school age and are diverse in terms of both ethnicity and risk variables. Further, the participants are involved in repeated in-home and laboratory assessments of risk, parenting variables, and

both pro- and anti-social behaviors. The level of assessment involved made inclusion of the attention tasks relatively simple. Thus, access to Study 2 participants provided an ideal venue in which to answer the questions we hoped to address that went beyond those answered in Study 1.

CHAPTER III

STUDY II

Introduction

The specific goals of Study 2 were to explore relationships between performance on tasks assessing executive attention and temperament variables, as well as to assess the contributions of temperament, executive attention, and parenting and risk variables to psychosocial outcomes. Specifically, it was hypothesized that performance on tasks assessing executive attention would be positively related to self- and parent-report Effortful Control and negatively related to self- and parent-report Negative Affectivity. Further, it was hypothesized that interference on an emotional Stroop task would specifically relate to depressive mood.

In addition, it was hypothesized that temperament, attention, and parenting and risk variables would all contribute significantly to explanation of scores on psychosocial measures such as depressive mood, aggression, problem behaviors, and prosocial behaviors. This chapter details the methods and results of Study 2, as well as a discussion of the findings.

Participants

Participants in Study 2 included 104 adolescents (63 female) and his or her parent or parents. The participants represented a sub-sample from a larger longitudinal intervention study taking place in the Portland, Oregon, area. The original sample was recruited from three area middle schools in one quadrant of the city representing a diverse community population in an area at risk for crime. The ethnic makeup of the sub-sample used for the current project included 34 European Americans (11 female), 48 African Americans (34 female), and 22 members of other ethnic groups (16 female). At the time participants were originally recruited, teacher ratings were used to identify low risk, at-risk, and high-risk youth. Risk was assessed using a 16-item measure developed to screen for risk in middle school (Teacher Risk Perception; adapted from Soberman, 1994, as ctied in Dishion, 1996). The Teacher Risk Perception provides a brief, single-sheet instrument by which a teacher may quickly evaluation the risk status of all students in the class. Areas of risk assessment include classroom behavior, tobacco use, involvement with troublesome or substance-using peers, and peer acceptance. The current sample included 26 adolescents in the no-risk group (11 female), 35 in the at-risk group (19 female), and 43 in the high-risk group (31 female). All participants were 16- to 17-years-of-age. Parent participants included 44 fathers and 96 mothers.

Measures

Questionnaire Measures

Temperament Questionnaire

Adolescent and adult participants completed the EATQ-R adapted for use with scanning technology. One reverse scored High Intensity Pleasure item ("I wouldn't like to live in a really big city, even if it was safe.") was deleted, because participants live in a large, metropolitan area.

Child and Family Center Questionnaire – Child Form.

The Child and Family Center Questionnaire – Child Form is an adaptation of an instrument designed to measure parenting constructs and anti-social peer associations and behaviors (Metzler, Biglan, Ary, & Fuzhong, 1998). Only youth report was utilized in the current study. The parenting constructs assessed include parental monitoring of activities (e.g., "In the past three months, how often did at least one of your parents know what you were doing when you were away from home?"; 5 response options ranging from "Never or almost never" to "Always or almost always"); parental rule-making ("My parents _____ that I should do homework every day"; 4 response options ranging from "Didn't have a rule or expectation" to "Had a clear rule"); positive family relationships ("Over the last month, I got along very well with my parents"; 5 response options ranging from "Never" to "Always"); and parent-child conflict ("In the last week did the following things happen between you and at least one of your parents? We got angry at each other."; 6 response options ranging from "Never" to "More than 7 times"). The

questionnaire also contains scales designed to measure prosocial activities ("In the past 3 months, how often did you participate in sport or organized activities?"; 5 response options ranging from "Never or almost never" to "Always or almost always"); and prosocial peer affiliation ("In the last 3 months did your friends cooperate with their teachers?"; 5 response options ranging from "Never or almost never" to "Always or almost always"), as well as antisocial activities ("Please mark how many times you have done each of the following in the last month: Lied to your parents about where you have been or who you were with?"; 6 response options ranging from "Never" to "More than 20 times"); and association with peers who engage in antisocial behaviors ("In the past week, how many times did you get together with friends who get into trouble a lot?"; 6 response options ranging from "Never" to "More than 7 times"). Appendix D contains a full listing of items by scale.

A 1998 study utilizing the parenting scales found that youths' reports of parenting constructs were stable over 3 quarterly waves of data collection (Metzler et al., 1998). Estimates of internal reliability ranged from .55 - .91. Scores on parenting constructs were significantly correlated with youths' reports of deviant behaviors and deviant peer associations.

Scoring

Mean scores were calculated for each scale, then standardized. Standardized scores for prosocial activities and prosocial peer association were combined to form a prosocial composite score; antisocial activities and peer association were combined to form a problem behavior score.

Attention Measures

General Procedures

The two attention tasks were presented on IBM compatible computers. Some participants completed the tasks at home; others in an office used by Project Alliance staff. Those completing the tasks at home used a laptop computer; those coming to the office used a desktop computer. All participants completed the Attention Network Test first, followed by the Counting and Emotional Stroop Test.

Attention Network Test

Participants completed the recently developed Attention Network Test (ANT; (Fan, McCandliss, Sommer, Raz, & Posner, 2002) designed to test the efficiency of the alerting, orienting, and executive attention systems. These three attention systems are viewed to be distinct in both functional and anatomical terms (Posner & Peterson, 1990). The alerting system is involved in the achievement and maintenance of an alert state, the orienting system in the selection of information from sensory input, and the executive system in resolving conflict among responses. The ANT produces reliable estimates of functioning of these three networks within a single task that can be performed by children, patients, and monkeys (Fan et al., 2002).

The executive attention system is often studied by conflict tasks, such as the Stroop color word task, which are known to activate areas of anterior cingulate and lateral prefrontal cortex. An additional type of conflict task involves presentation of

stimuli surrounded by incongruent flankers. Such tasks are also known to activate an area of anterior cingulate that overlaps, but is distinct from, areas activated by other conflict tasks. The ANT utilizes a modification of a flanker task, and includes manipulation of warning cues that serve to, in some instances, activate the alerting system and, in others, to provide spatial information necessary for orienting. A recent study utilizing the ANT with 40 adult subjects found significant test-retest reliability, with correlations between two sessions at .52 for alerting scores, .61 for orienting scores, and .77 for interference scores (Fan et al., 2002).

Stimuli

Stimuli were presented on a computer screen. Participants were presented a central fixation cross, then one of four warning cues: no-cue, center-cue, double-cue, or a spatial-cue. The no-cue condition did not provide alerting or orienting cues. The center-cue consisted of an asterisk presented at the location of the fixation cross, and provided an alerting cue. The double-cue consisted of two asterisks presented one degree above and one degree below the fixation cross. This cue provided alerting but with a larger attentional field than in the center cue condition. The spatial-cue consisted of an asterisk presented either one degree above or below the fixation cross, and indicated the location of the target stimuli to follow, thus providing an orienting cue.

Participants were then presented target stimuli consisting of five arrows pointing left or right. The target was a central arrow flanked on either side by two additional arrows identical in size and color to the central arrow. In some trials, the flanking arrows pointed in the same direction as the central arrow. These trials were considered

congruent trials. In other, incongruent trials, the flanking arrows pointed in the opposite direction as the central arrow. The participants were instructed to press a mouse key to identify the direction of the target arrow. Figure 8 illustrates the experimental procedure.

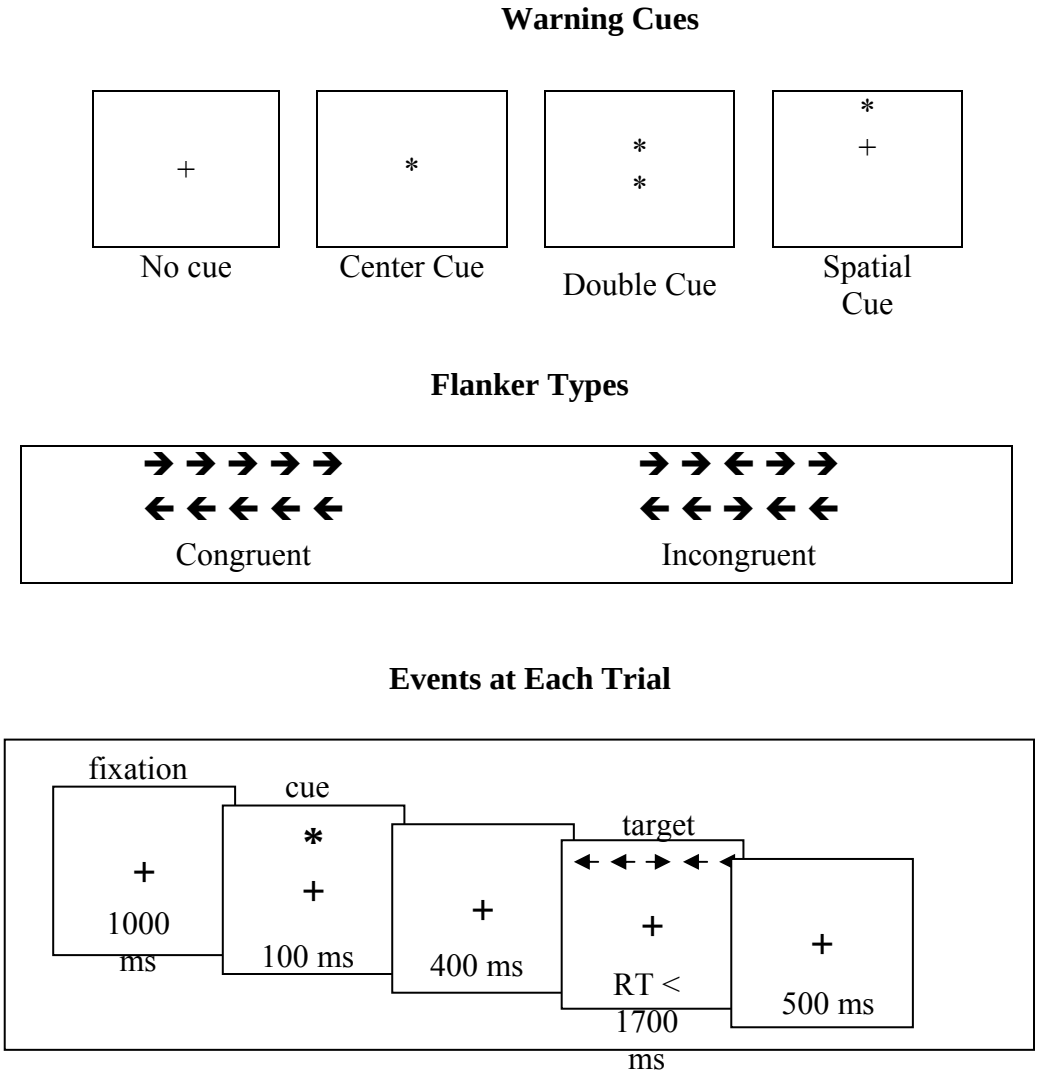


FIGURE 8. Attention Network Task Procedure

Procedure

Participants first read a set of instruction screens (see Appendix D for text of instructions). Instructions indicated that a group of arrows would appear on the screen, and participants were instructed to press the button on the mouse that matched the direction that the center arrow was pointing. Participants were told to maintain fixation on the center of the screen at all times.

Each trial consisted of five events. First, a central fixation cross was presented for a duration of 1000 ms. This was followed on some trials by a warning cue presented for 150 ms. The fixation-cross then appeared for an additional 400 ms, followed by either congruent or incongruent target stimuli. Target stimuli remained on the screen until the participant responded, at which point the computer registered the accuracy of the response as well as the reaction time in ms. If the participant did not respond after 1700 ms, the target disappeared and the computer registered a null response. Each session consisted of 24 practice trials followed by two blocks of 64 trials each. Within each block, half the trials were congruent, half were incongruent. Each cue type occurred eight times. Presentation was randomized within blocks.

Scoring

Three reaction time scores were calculated for each participant. The first score, the interference score, was calculated by subtracting the mean RT of all congruent flanking conditions, summed across cue types, from the mean RT of incongruent flanking conditions. For example, an individual with a mean RT of 650 ms for congruent trials

and a mean RT of 750 ms for incongruent trials would receive an interference score of 100 ms. Conversely, an individual with a mean RT of 650 ms for congruent trials but a mean RT of 800 ms for incongruent trials would receive an interference score of 150 ms. Errors were also calculated for each type of trial.

The orienting effect was calculated as follows: The mean RT of spatial-cue conditions was subtracted from the mean RT of trials involving the center-cue. The alerting effect was calculated by subtracting the mean RT of double-cued trials from the mean RT of no-cue trials. Scoring procedures followed those developed by Fan et al. (2002).

Emotion and Counting Stroop Task

Participants completed the Emotion and Counting Stroop Task, for which the methodology was adapted from two similar tasks designed for use in MRI imaging studies (Bush et al., 1998; Whalen et al., 1998). Counting Stroop tasks involve presentation of number words that are either congruent or incongruent with the number of words presented on the screen. Neuroimaging studies have found such tasks to activate an area of anterior cingulate near the area activated by conventional Stroop tasks. The Emotion Stroop substitutes negatively valenced emotion words for neutral words in the task, and has been found in neuroimaging studies to activate an area of the anterior cingulate that is very near, but distinct from, the area activated by the Counting Stroop task. The two tasks were combined to allow direct comparison of emotional and cognitive interference effects within subjects.

Stimuli

Stimuli were presented on a computer screen. Participants were presented a central fixation cross, then a word presented in the middle of the screen, either one, two, three, or four times. When words were presented multiple times, they were listed vertically in the middle of the screen. Stimuli words were categorized as neutral, number, or emotion words, and are presented in Table 13. Words were chosen from a corpus of words generated by children and adolescents for use in such tasks (Doost, Moradi, Taghavi, Yule, & Dalgleish, 1999).

TABLE 13. Emotion and Counting Stroop Stimuli

Neutral	Number	Emotion
Dog		Sad
Cat		Cry
Fox	One	Die
Duck	Two	Fear
Horse	Three	Worry
Whale	Four	Crazy
Sheep		Panic
Rabbit		Lonely

Procedure

Participants first read a set of instruction screens (see Appendix E). Instructions indicated that a group of 1-4 words would appear on the screen, and participants were

instructed to press a button on the keyboard that corresponded with the number of words presented on the screen.

Each trial began with a central fixation cross, presented for a duration of 1000 ms. This was followed by presentation of target stimuli which remained on the screen until the participant responded, at which point the computer registered both the accuracy of the response as well as the reaction time in milliseconds. If the participant did not respond after 1700 ms, the target disappeared and the computer registered a null response.

Each session consisted of 24 practice trials followed by one block of 96 trials each; 32 neutral, 32 number, and 32 emotional trials. Each neutral cue, as well as each emotion cue, was presented four times, with each word presented in groups of 1, 2, 3, and 4 words. Each number trial was presented eight times in various combinations of 1, 2, 3, or 4 words per trial. However, every number trial was incongruent; that is, the words used for the stimuli never matched the number of times it was presented. Presentation was randomized.

Scoring

Two interference scores were calculated for each participant. The first, the Counting Stroop interference score, was calculated by subtracting the mean RT for neutral trials from the mean RT for number trials. The second, the Emotion Stroop interference score, was calculated by subtracting the mean RT for neutral trials from the mean RT for emotion trials. Errors for each trial were also calculated.

RESULTS

Questionnaire Measures

EATQ-R

Internal Consistency

A series of item-total analyses were performed by reporter to estimate coefficient alpha (Cronbach's) for each scale and subscale. Results are reported in Table 14. For self-report scales, alpha ranged from .70 - .81 and alpha for subscales ranged from .43 - .82 (see Table 14). For parent-report, scale alphas ranged from .69 - .81 and alpha for subscales ranged from .50 - .84. Average inter-item correlation was calculated for each subscale to further insure internal consistency even within small clusters of items covering broad dimensions of behavior. Subscale average inter-item correlations averaged .35.

Agreement between Reporters

Agreement between self- and mother-report by gender is reported in Table 15, as well as agreement between self- and father-report, between self- and combined mother-father report scores, and between mother- and father-report. Agreement between female participants and mothers ranged from -.07 to .48, and was statistically significant for the Attention, High Intensity Pleasure, Fear, Shyness, and Depressive Mood subscales, as well as overall Surgency. In addition, agreement on the Affiliation subscale was significant at the level of a trend. For males, correlation with mother-report ranged from

-.07 to .40 and reached significance for subscales measuring Shyness and Aggression and, at trend level, Inhibitory Control.

Too few fathers completed the EATQ-R to allow examination of agreement by gender; however, agreement with genders combined ranged from -.09 to .41, and reached significance for subscales measuring Inhibitory Control, High Intensity Pleasure, Depressive Mood, and Aggression, and, at the level of a trend, overall Surgency. Combining mother and father report yielded levels of agreement ranging from -.01 to .51, and reached significance for the Inhibitory Control, High Intensity Pleasure, Depressive Mood, and Aggression subscales and, at trend level, the Attention and Shyness subscales. Further, agreement was statistically significant for overall Surgency and, at trend level, overall Negative Affectivity. Combining parent reports improved agreement on Surgency and Negative Affectivity above that achieved by either parent alone; however, agreement on Effortful Control was slightly poorer than for father-report alone.[2] Mother- and father-report agreement ranged from .31 to .75, and was statistically significant for all scales and subscales.

Mean Differences between Reporters

Scale means by gender, and reporter (self and mother) are presented in Table 16. Female participants rated themselves higher in Affiliation ($t(55) = 2.10$, $p < .05$) and Frustration ($t(55) = 2.05$, $p < .05$) than did their mothers, and lower in Aggression ($t(55) = -1.79$, $p = .08$; overall Negative Affectivity; self-report higher; ($t(55) = 1.72$, $p = .08$) at

[2] Mother report for those individuals whose fathers completed questionnaires were similar to levels of agreement for all mothers in Sample 2. However, agreement on the Inhibitory Control subscale was .41.

trend level. Males rated themselves significantly higher in Attention ($t(39) = 2.31$, $p < .05$) than did mothers, and lower in Aggression ($t(39) = -1.99$, $p = .054$) at trend level.

TABLE 14. Cronbach's Alpha Scale and Subscale Reliabilities by Reporter

Study 2

Scale	*Subscale*	*Self-Report* $n = 106$	*Mother-Report* $N = 90$
Effortful Control		.81	.78
	Activation Control	.64	.79
	Attention	.55	.72
	Inhibitory Control	.43	.50
Affiliativeness		.81	-
	Affiliation	.65	.72a
	Perceptual Sensitivity	.63	-
	Pleasure Sensitivity	.72	-
Surgency		.70	.69
	High Intensity Pleasure	.53	.68
	Fear (reverse scored)	.61	.67
	Shyness (reverse scored)	.75	.84
Negative Affect		.83	.81
	Frustration	.82	.76
	Depressive Mood	.78	.74
	Aggression	.69	.79

[a]Only the Affiliation subscale is included in parent report Affiliativeness

TABLE 15. Temperament Score Correlations between Reporters
Sample 2

	Self-Mother, Female $n = 51$	*Self-Mother, Male* $n = 39$	*Self-Father* $n = 40$	*Self-Mother/Father Combined* $n = 35$	*Mother-Father* $n = 35$
Effortful Control	.10	.12	.20	.18	.75**
Activation Control	.17	.03	.22	.12	.50**
Attention	.28*	.26	.19	.29+	.73**
Inhibitory Control	.04	.29+	.40*	.38*	.69**
Affiliation	.30+	.01	.09	.25+	.31+
Surgency	.48**	.09	.26+	.38*	.60**
High Intensity Pleasure	.31*	.23	.41**	.51**	.53**
Fear	.28*	-.07	.21	.21	.66**
Shyness	.27*	.39*	.24	.29+	.51**
Negative Affect	.13	.01	.22	.25+	.64**
Frustration	-.07	.17	-.09	-.01	.40*
Depressive Mood	.45**	.04	.39**	.47**	.74**
Aggression	.18	.32*	.30*	.36*	.46**

+ $p < .10$, * $p < .05$, ** $p < .01$.

TABLE 16. Temperament Scores by Gender and Reporter, Sample 2

Scale	*Self, Female* *M (SD)* $n = 56$	*Mother, Female* *M (SD)* $n = 51$	*Self, Male* *M (SD)* $n = 40$	*Mother, Male* *M (SD)* $n = 39$
Effortful Control	3.44(.50)	3.35(.47)	3.34(.47)	3.18(.57)
Activation Control	3.06(.70)	3.06(.60)	2.94(.76)	2.77(.79)
Attention	3.51(.65)	3.41(.60)	3.50(.54)	3.25(.77)*
Inhibitory Control	3.70(.59)	3.56(.57)	3.62(.59)	3.62(.61)
Affiliation	3.82(.68)	3.62(.72) *	3.58(.72)	3.46(.71)
Surgency	3.37(.57)	3.44(.45)	3.63(.49)	3.66(.50)
High Intensity Pleasure	3.14(.76)	3.20(.55)	3.27(.59)	3.31(.66)
Fear	2.56(.66)	2.41(.66)	2.18(.62)	2.04(.71)
Shyness	2.43(.98)	2.46(.83)	2.29(.95)	2.30(.78)
Negative Affect	2.70(.58)	2.63(.50) +	2.48(.56)	2.59(.57)
Frustration	3.23(.85)	2.92(.69) *	3.04(.81)	3.09(.75)
Depressive Mood	2.68(.79)	2.51(.81)	2.09(.69)	2.09(.69)
Aggression	2.23(.69)	2.44(.66)+	2.26(.73)	2.53(.76)+

Paired Samples *t* test
Difference between parent- and self-report: + $p < .10$, * $p < .05$, ** $p < .01$.

Correlations between Scales

Correlations between temperament scale scores and scores on the two socio-emotional scales are presented in Table 17. Both Aggression and Depressive Mood were negatively correlated with Effortful Control and positively correlated with Frustration, and with each other, in both parent- and self-report. In addition, Depressive Mood was negatively related to Surgency in both parent- and self-report. However, in self-report Affiliativeness showed a modest, but significant, positive correlation with Depressive Mood and a modest negative correlation with Aggression. For parent-report, only the negative relationship with Aggression was evident.

Gender Differences

Females in Study 2 reported themselves as significantly higher on subscales measuring Depressive Mood ($t(101) = -3.95$, $p < .001$), Pleasure Sensitivity ($t(101) = -3.73$, $p < .001$), and Fear ($t(101) = -3.03$, $p < .01$) than males in their sample, and higher in both Affiliation ($t(101) = -1.91$, $p = .06$) and Perceptual Sensitivity ($t(101) = -1.91$, $p = .054$) at trend level. Gender differences in scale scores reached statistical significance for Affiliativeness (females higher, $t(101) = -3.19$, $p < .001$), and Surgency (males higher, $t(101) = 2.32$, $p < .001$), and at trend level for Negative Affectivity (females higher, $t(101) = 1.99$, $p = .05$).

TABLE 17. Pearson's Correlations between Scales, Study 2
Pearson's Correlations – Self-Report Temperament

	1	*2*	*3*	*4*	*5*	*6*
1-Effortful Control	-	.26**	.11	-.58**	-.34**	-.36**
2-Affiliation	.11	-	.32**	-.15	.04	-.06
3-Surgency	.07	-.08	-	-.00	-.39**	-.03
4-Aggression	-.42**	-.07	-.08	-	.17+	.56**
5-Depressive Mood	-.36**	.24**	-.46**	.31**	-	.15
6-Frustration	-.33**	.25**	-.20*	.29**	.43**	-

Parent-report values above the diagonal, self-report below
+ $p < .10$, *$p < .05$, **$p < .01$

Child and Family Center Questionnaire – Child Form (CFCQC)

Forty-three males and 60 females completed the CFCQC. Scale scores are summarized in Table 18. Independent samples *t* tests revealed a significant gender difference in Deviant Peer Association scores ($t(101) = 2.07$, $p < .05$), such that males reported greater association with deviant peers than did females. Conversely, females reported greater association with prosocial peers than did males, but only at trend level ($t(101) = -1.78$, $p = .08$). No other significant gender differences were observed.

Correlations between CFCQC scale scores are presented in Table 19. As illustrated, Deviant Peer Relation and Deviant Behavior Scores were highly correlated ($r = .78$, $p < .001$). In addition, Parental Monitoring, Relationship Quality, Parental Rules, and Prosocial Peer association were all significantly negatively related to both Deviant Behavior and Deviant Peer Association (see Table 19 for values). Further, Family

TABLE 18. CFCQC Scale Scores by Gender

Scale	*Female M (SD)*	*Male M (SD)*	*Combined M(SD)*
Parental Monitoring	2.71 (1.11)	2.72 (.97)	2.71 (1.05)
Parental Rules	1.99 (.72)	1.90 (.67)	1.95 (.72)
Family Conflict	.60 (.77)	.71 (.64)	.65 (.72)
Relationship Quality	2.45 (1.02)	2.49 (.92)	2.47 (.98)
Deviant Peer Associations	.58 (.67)	**.87 (.71)***	.70 (.69)
Deviant Behaviors	.34 (.48)	.35(.44)	.34 (.46)
Pro-social Peer Associations	**2.56 (.70)+**	2.31 (.70)	2.43 (.71)
Pro-social Behaviors	2.57 (.60)	2.51 (.70)	2.54 (.64)

Independent Samples *t* test;
Significant Gender Difference: + $p < .10$, * $p < .05$

Conflict was positively related to Deviant Peer Relations and, at trend level, to Deviant Behavior. Prosocial Peers and Prosocial Behavior were positively related, and were both related to Parental Monitoring, Relationship Quality, and Parental Rules. In addition, Prosocial Peer scores were negatively related to both Deviant Behaviors and Deviant Peers (see Table 19).

Attention Measures

Attention Network Test

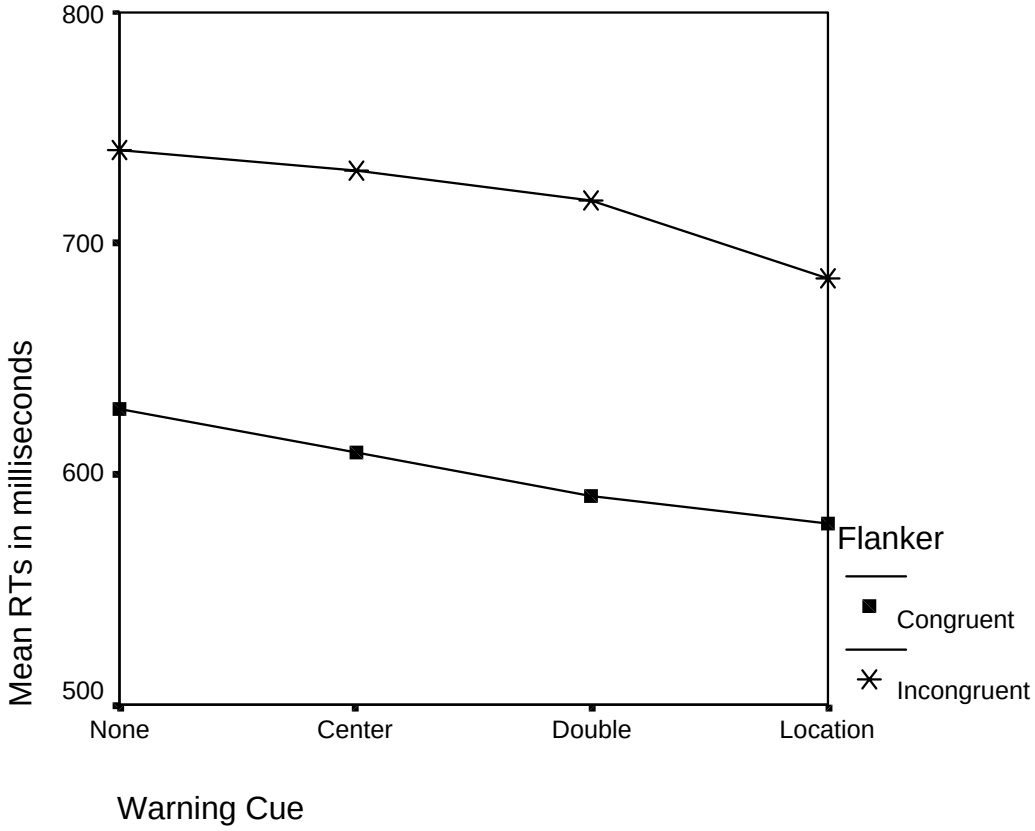
Forty-one males and 61 females completed the ANT; however, data for 1 male and 4 females were not included in the analysis because their scores indicated a pattern of responding to flanker direction rather than target direction. Median reaction time data by

flanker and warning cue type were calculated for remaining participants. Means of these calculations are presented in Table 20. A 2 x 4x 2 (Flanker x Warning Type x Gender) repeated measures analysis of variance revealed a significant main effect of flanker type ($F(1, 98) = 378.35$, $p < .001$), such that Reaction Times (RTs) for trials involving incongruent flankers were longer than those involving congruent flankers. In addition, there was a significant main effect of warning cue type ($F(3, 294) = 57.68$, $p < .001$), and planned linear contrasts revealed that warning types significantly decreased across types ($F(1, 98) = 137.06$, $p < .001$; no-cue, center-cue, double-cue, location-cue) as illustrated in Figure 9. Additionally, tests of between subjects effects revealed a significant main effect of gender $F(1, 98) = 6.97$, $p < .05$), such that males had significantly shorter RTs than did females (see Figure 10).

TABLE 19. CFCQC Correlations between Scales

Scale	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1-Parental Monitoring	-						
2-Parental Rules	**.35****	-					
3-Family Conflict	-.04	-.13	-				
4-Relationship Quality	**.42****	**.20***	**-.47****	-			
5-Deviant Peer Associations	**-.34****	**-.34****	**.30****	**-.38****	-		
6-Deviant Behaviors	**-.42****	**-.24***	.19+	**-.40****	**.78****	-	
7-Pro-social Peer Associations	**.43****	**.33****	-.01	**.26****	**-.23***	**-.22***	-
8-Pro-social Behaviors	**.49****	**.32****	-.03	**.41****	-.12	-.15	**.58****

+ $p < .10$; * $p < .05$; ** $p < .01$.

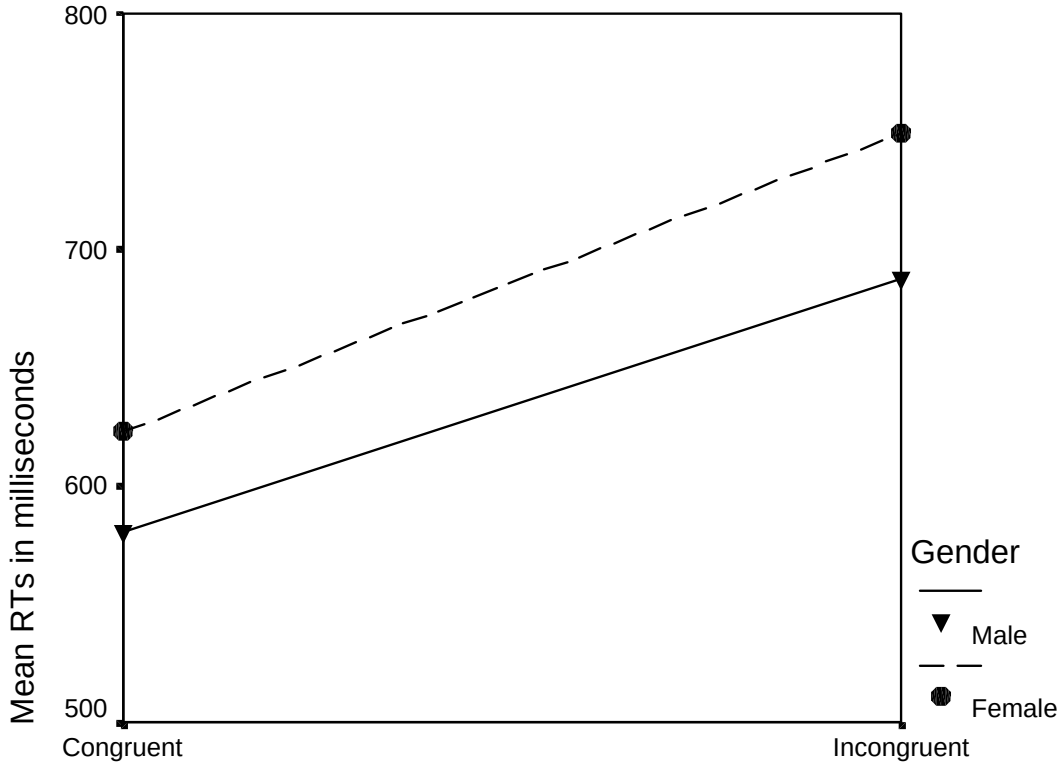


Main effect of flanker type; p<.001
Main effect of warning cue type; p<.001

FIGURE 9. ANT RTs by Flanker and Warning Cue Type

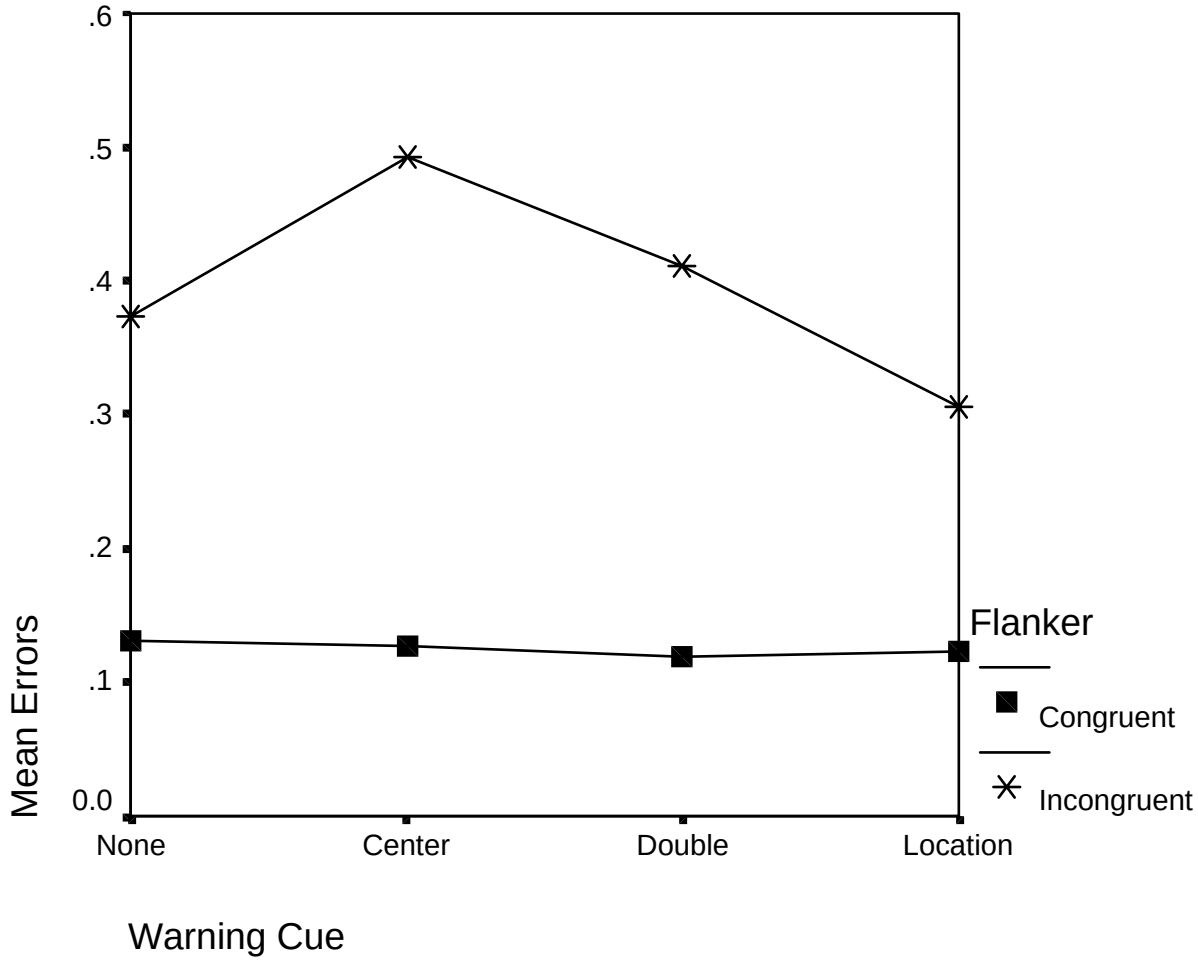
Errors were also submitted to a 2 x 4 x 2 (Flanker x Warning Type x Gender) repeated measures analysis of variance, revealing a significant main effect of flanker ($F(1, 98) = 29.78$, $p < .001$), indicating that participants made significantly more errors during trials involving incongruent trials (see Figure 11). No other main effects or interactions were present.

A series of RT subtractions were performed, and results are presented in Table 21, as well as error rates by trial type and gender, and overall RTs. Alerting scores were calculated as the difference between no cue and double cue trials; orienting as the difference between center cue and location cue trials; and interference as the difference between congruent and incongruent trials. There were no significant gender differences between RT subtraction scores.



Gender; $p < .05$

FIGURE 10. ANT RTs by Gender and Flanker Type



Main effect of flanker type; $p < .001$

FIGURE 11. ANT Errors by Flanker and Warning Cue Type

Table 20. ANT RTs by Gender, Flanker Type, and Warning Cue Type

Gender	*Flanker Type*	*Warning Type*			
		No Cue	*Center Cue*	*Double Cue*	*Spatial Cue*
Male *n* = 40	Congruent	599.61 (88.80)	578.17 (83.40)	561.86 (77.76)	546.62 (75.47)
	Incongruent	694.13 (89.51)	702.74 (113.97)	692.30 (124.97)	655.04 (119.54)
Female *n* = 61	Congruent	644.90 (86.11)	630.55 (91.36)	609.41 (84.64)	598.26 (95.09)
	Incongruent	779.45 (127.09)	759.87 (127.01)	744.23 (119.46)	714.15 (129.84)
Total	Congruent	630.47 (97.67)	611.29 (89.35)	592.32 (89.35)	580.69 (98.65)
	Incongruent	744.41 (122.13)	734.16 (124.04)	720.87 (124.09)	687.55 (128.14)

TABLE 21. ANT Attentional Network Subtractions by Gender

Gender	*Attentional Networks Subtractions*				*Errors Congruent*	*Errors Incongruent*
	Alerting	*Orienting*	*Conflict*	*Overall RT*		
Male	19.70 (33.08)	47.97 (41.83)	107.49 (43.44)	599.09 (77.41)	.23 (.68)	1.48 (1.92)
Female	24.07 (51.62)	35.19 (38.87)	118.61 (56.56)	653.35 (87.39)	.58 (1.24)	1.40 (2.01)
Total	22.10 (44.11)	40.93 (40.52)	113.62 (51.12)	628.99 (87.98)	.43 (1.04)	1.44 (1.96)

Counting and Emotional Stroop Task

Forty-four males and 61 females completed the Counting and Emotional Stroop Task. However, one male participant had errors in excess of 4 standard deviations above the mean; thus his scores were eliminated from further analyses. RT, conflict, and error rates for remaining participants by gender and trial type are summarized in Table 22. A 3 x 2 (Trial Type x Gender) repeated measures analysis of variance revealed a significant main effect of type, ($F(2, 202) = 28.91$, $p < .001$), and planned simple contrasts revealed

TABLE 22. Counting and Emotional Stroop RTs, Conflict, and Errors By Gender and Stimulus Type

Gender		*Stimulus Type*			
		Neutral	*Number*	*Emotion*	*Total*
Male $n = 44$	Reaction Time	676.51 (117.64)	704.26 (131.38)	677.07 (119.11)	690.50 (136.19)
	Conflict Effect	N/A	38.99 (71.61)	5.30 (40.29)	22.14 (48.08)
	Errors	.47 (.88)	1.77 (1.36)	.67 (.81)	2.91 (1.87)
Female $n = 61$	Reaction Time	769.02 (143.32)	812.30 (170.17)	767.93 (151.00)	783.08 (151.16)
	Conflict Effect	N/A	43.28 (73.58)	-1.09 (38.09)	21.10 (48.60)
	Errors	.30 (.64)	1.02 (1.25)	.44 (.81)	1.75 (2.01)
Total	Reaction Time	731.64 (142.17)	773.13 (171.71)	733.22 (149.59)	746.00 (150.97)
	Conflict Effect	N/A	41.49 (72.60)	1.58 (38.96)	21.53 (48.15)
	Errors	.37 (.75)	1.33 (1.34)	.54 (.82)	2.24 (2.03)

TABLE 23. Pearson's Correlations – ANT Measures
Genders Combined

	1	*2*	*3*	*4*	*5*
1-Alert	-				
2-Orient	.14	-			
3-Interference	.01	-.03	-		
4-Congruent Errors	-.11	-.16	**-.24***	-	
5-Incongruent Errors	-.12	**-.24***	.16	**.30****	-
6-Mean RT	-.12	-.07	**.46****	.18+	-.12

*$p < .05$, ** $p < .01$.

that the difference existed between neutral and number trials ($F(1, 101) = 33.07$, $p < .001$), while there was no significant difference between neutral and emotion trials. In addition, there was a significant main effect of gender ($F(1, 101) = 9.39$, $p < .001$), such that females had longer reaction times than did males (see Figure 12). While emotion trials did not produce significantly higher RT than neutral trials, an examination of distributions showed that many participants had shorter RTs during emotion than neutral trials, thus this measure was retained as a measure of interference.

Errors were also submitted to a 3 x 2 (Type x Gender) repeated measures analysis of variance. There was a significant main effect of type, ($F(2, 202) = 35.76$, $p < .001$), and planned simple contrasts revealed that the difference existed between neutral and number trials ($F(1, 101) = 48.03$, $p < .001$). In addition, errors for emotion trials were higher than errors for neutral trials, but only at trend level ($F(1, 101) = 3.46$, $p = .06$). A significant main effect of gender was present ($F(1, 101) = 8.43$, $p < .01$), indicating that

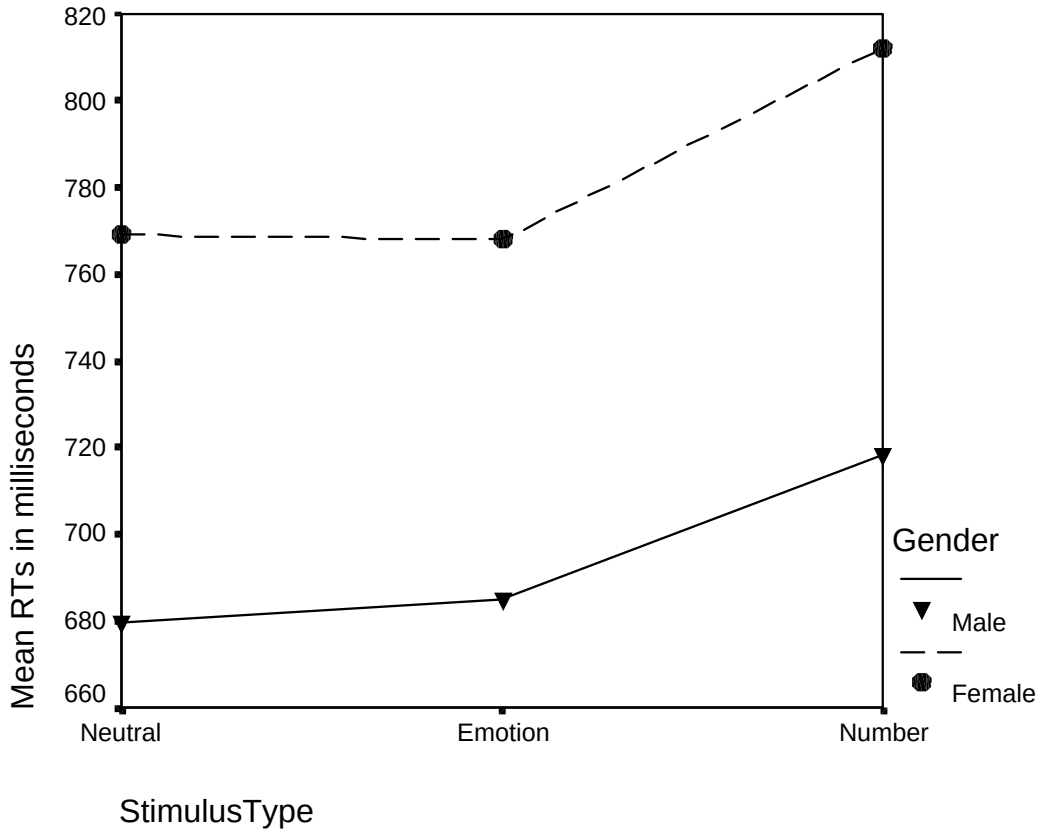
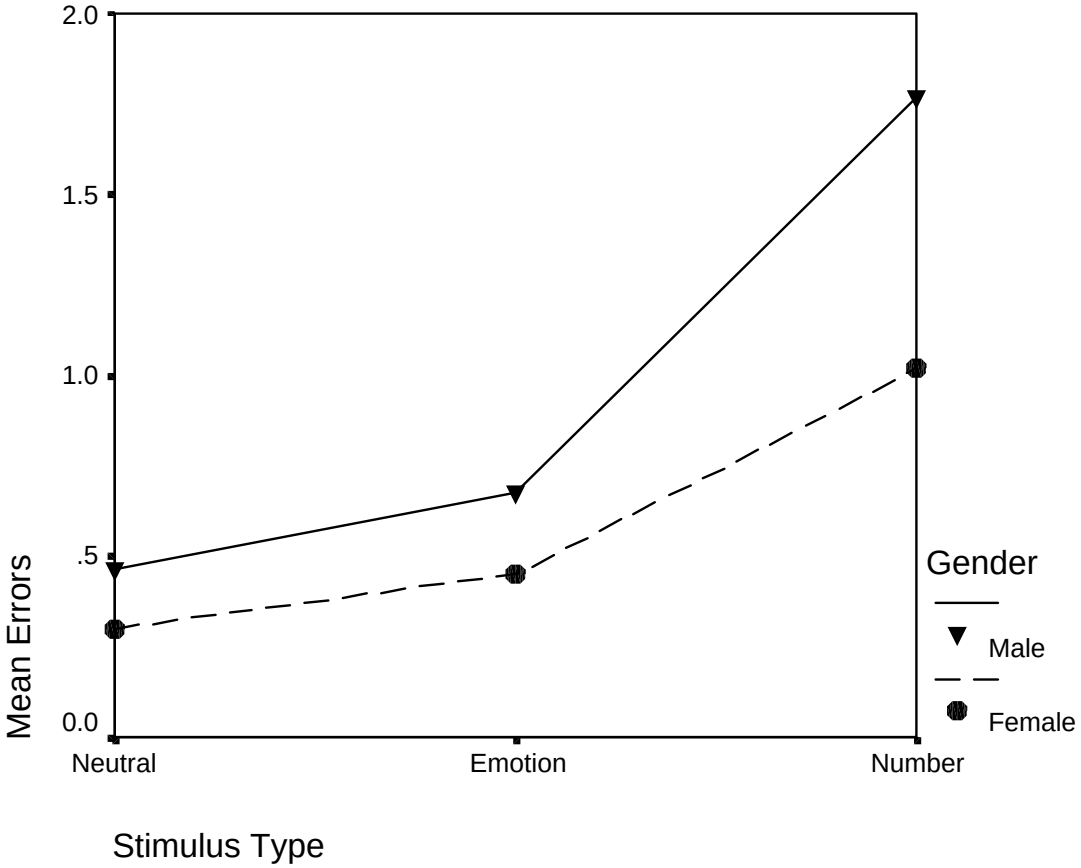


FIGURE 12. Counting and Emotional Stroop RTs by Stimulus Type and Gender

males made significantly more errors overall than did females. In addition, a Type x Gender interaction was present ($F(2, 202) = 3.20$, $p < .05$), such that the gender difference occurred primarily in number trials (see Figure 13).

Stroop number conflict effects were calculated as a difference between neutral and number trials; emotion conflict effects were calculated as the difference between neutral and emotion trials. Independent samples *t* test revealed no significant gender differences in conflict effects.



Main effect of stimulus type; $p < .001$
Main effect of gender; $p < .01$

FIGURE 13. Counting and Emotion Stroop Errors
By Stimulus Type and Gender

Correlations between Attention Measures

Correlations between various aspects of performance on the attention tasks are presented in Tables 23-29. With genders combined, the three attention network scores measured by the ANT were uncorrelated. As gender differences were noted in performance, however, correlations were also examined by gender. In females, the alerting and orienting effects were modestly related ($r = .25$, $p = .06$). Errors were related in females ($r = .42$, $p < .01$), but not in males. In the Counting and Emotion Stroop task, Emotion and Counting Stroop Interference were related in the full sample ($r = .47$, $p < .01$) as well as in both genders. Further, errors across trial types were related in the full sample, but to a greater degree in males than in females. Errors across the two tasks were related in the full sample, but primarily for females. RTs for the two tasks were also related.

TABLE 24. Pearson's Correlations – ANT Measures by Gender

	1	*2*	*3*	*4*	*5*	*6*
1-Alert	-	-.02	-.07	.08	.06	**-.28+**
2-Orient	**.25+**	-	-.02	-.18	.08	.02
3-Interference	.08	.04	-	-.31	.15	**.44****
4-Congruent Errors	-.17	**-.29***	**-.32***	-	.06	-.12
5-Incongruent Errors	-.21	**-.43****	.17	**.42****	-	**-.40****
6-Mean RT	-.08	-.07	**.47****	.17	.06	-

Values for male participants fall above the diagonal; values for females fall below
* $p < .05$, ** $p < .01$.

TABLE 25. Pearson's Correlations – Counting and Emotion Stroop Measures Genders Combined

	1	*2*	*3*	*4*	*5*
1-Stroop Interference	-				
2-Emotion Interference	**.47****	-			
3-Neutral Errors	.06	.16	-		
4-Number Errors	-.01	-.06	.07	-	
5-Emotion Errors	-.03	-.01	**.25***	**.30****	-
6-Mean RT	**.33****	**.21***	-.07	-.09	**-.29****

* $p < .05$, ** $p < .01$

TABLE 26. Pearson's Correlations – Counting and Emotional Stroop Measures by Gender

	1	*2*	*3*	*4*	*5*	*6*
1-Stroop Interference	-	**.43****	-.14	-.10	-.10	**.27+**
2-Emotion Interference	**.50****	-	-.14	**-.29+**	-.15	.13
3-Neutral Errors	**.25***	**.42****	-	-.15	.22	**-.27+**
4-Number Errors	.08	.07	**.24+**	-	.15	-.03
5-Emotion Errors	.04	.07	**.26***	**.37****	-	-.20
6-Mean RT	**.34****	**.29***	.15	.00	**-.30***	-

Values for male participants fall above the diagonal; values for females fall below
* $p < .05$, ** $p < .01$.

TABLE 27. Pearson's Correlations between Attention Task Measures
Genders Combined

	Stroop Inter.	*Emotion Inter.*	*Neutral Errors*	*Number Errors*	*Emotion Errors*	*Mean RT*
Alert	-.01	**-.23***	-.12	-.05	.03	-.19
Orient	.01	.12	-.02	-.11	.03	-.09
Interference	.00	-.09	-.09	-.07	-.10	.09
Congruent Errors	.02	.06	-.04	-.04	.03	**.23***
Incongruent Errors	-.17+	-.01	.02	**.31****	**.26****	-.12
Mean RT - ANT	.22*	.16	-.09	**-.27****	**-.34****	**.60****

* $p < .05$, ** $p < .01$

TABLE 28. Pearson's Correlations between Attention Task Measures
Females

	Stroop Inter.	*Emotion Inter.*	*Neutral Errors*	*Number Errors*	*Emotion Errors*	*Mean RT*
Alert	-.16	**-.28***	**-.24+**	-.12	-.03	-.21
Orient	.01	.08	.14	-.17	-.02	-.22
Interference	-.04	-.11	-.12	-.00	-.02	.09
Congruent Errors	-.01	.10	.00	.01	.05	**.23+**
Incongruent Errors	-.04	.15	-.20	**.33***	**.39****	.03
Mean RT - ANT	.16	.20	-.04	-.19	**-.28***	**.49****

* $p < .05$, ** $p < .01$

TABLE 29. Pearson's Correlations between Attention Task Measures
Male

	Stroop Inter.	*Emotion Inter.*	*Neutral Errors*	*Number Errors*	*Emotion Errors*	*Mean RT*
Alert	**.32***	-.12	.02	.11	.16	-.24
Orient	.03	.16	-.17	-.15	.05	.20
Interference	.06	-.04	-.07	-.10	-.17	.01
Congruent Errors	.09	-.08	-.13	.11	.25	-.13
Incongruent Errors	**-.36***	**-.26+**	.24	**.29+**	.10	**-.40****
Mean RT - ANT	**.30+**	.14	-.07	-.21	**-.34***	**.69****

* $p < .05$, ** $p < .01$

Adjusted Interference Scores

Examination of RTs and errors revealed that, in males, overall ANT reaction time was negatively associated with errors. This pattern indicates that participants may have been sacrificing accuracy for speed. Thus, an individual may have low interference scores, but a high number of errors. This same pattern was also evident for females in Emotion errors on the Counting and Emotion Stroop, and in Number errors for males.

To examine the effects of this speed-accuracy tradeoff more closely, scores for interference and errors were standardized within each task and recoded as follows for each task: 1= Low interference and errors (> 1 *SD* below the mean on interference, combined with below average errors, or > 1 *SD* below the mean on errors, combined with below average interference); 2 = Average interference and errors (both interference and

errors fall within 1 *SD* of the mean); 3 = Moderate interference and errors (> 1 *SD* above the mean on interference, combined with above average errors, or > 1 *SD* above the mean on errors, combined with above average interference); and 4 = High interference and errors (> 1 *SD* above the mean on both interference and errors). Individuals scoring > 1 SD below the mean on interference combined with > 1 SD above the mean on errors were coded as "0" and excluded from further analysis for that particular task. This included 4 males and 3 females on the ANT, 1 male on the Counting Stroop task, and 2 males and 1 female on the Emotion task.

Attention task RTs were related across tasks, as were errors (Tables 27-29). In addition, Principal Component factor analysis with Varimax rotation of RT and error scores revealed two factors that together explained 57.89% of the variance in scores. The first consisted of RT data across tasks, while the other consisted of error data across tasks. These findings suggested that task performance was related in a consistent fashion, and a composite score across tasks (Total Interference) was calculated as the mean of the individual task scores. Thus, an individual whose score on the ANT was zero would receive a composite score that only included the other tasks.

Means and standard deviations of Total Interference scores by gender and risk group are presented in Table 30. A 2 x 3 (Gender x Risk Group) univariate ANOVA revealed a significant main effect of risk group ($F(1, 91) = 3.66$, $p < .05$), such that individuals in the higher risk groups had higher interference scores. No gender differences were found. Table 31 presents correlations between the adjusted interference scores. Counting Stroop Interference and ANT Interference were positively correlated.

In addition, Counting Stroop and Emotion Stroop were correlated at trend level. However, Emotion Stroop and ANT Interference were not related.

TABLE 30. Total Interference Scores by Risk Group and Gender

Risk Group	*Gender*	*N*	*Mean (SD)*
No Risk	Male	17	2.10 (.66)
	Female	10	2.15 (.65)
At Risk	Male	15	2.67 (.71)
	Female	17	2.12 (.52)
High Risk	Male	12	2.58 (.53)
	Female	28	2.64 (.90)

TABLE 31. Pearson's Correlations between Adjusted Interference Scores Genders Combined

	1	*2*	*3*
1-ANT	-		
2-CT Stroop	.21*	-	
3-Emotion	.05	.16	-

Correlations between Measures

Temperament and Attention Tasks

Correlations between the adjusted attention interference scores and both self- and mother-report temperament with genders combined are reported in Tables 32-33. Results are summarized here by scale.

Effortful Control

There were no significant relationships between the adjusted interference scores and self-report temperament. However, adjusted ANT interference was negatively related to mother-report Effortful Control including Inhibitory Control and, at trend level, Attention. Stroop Interference was also negatively related to mother-report Effortful Control, including Activation Control and, at trend level, Inhibitory Control. Adjusted Emotion Stroop Interference was also negatively related to mother report Inhibitory Control. The Total Interference measure was negatively related to mother-report Effortful Control, including Attention and Inhibitory Control.

Affiliativeness

No significant relations between interference and Affiliativeness and its subscales were observed.

Negative Affectivity

ANT interference was negatively related to self-reported Frustration, Depressive Mood at trend level, and overall Negative Affectivity. However, mother-report ANT and Counting Stroop Interference were positively related to Aggression, as was Total Interference. Counting Stroop and Emotion Interference were related, at trend level, to Depressive Mood, and Total Interference was also related to Depressive Mood. Counting Stroop, Emotion, and Total Interference were all positively related to overall mother-report Negative Affectivity.

Surgency

No significant relations existed between self-report or mother-report Surgency and performance on the attention tasks.

Adjusted Interference Scores and Father-report Temperament

A subsample of 40 participants also had father-report temperament data, allowing comparison of attention task performance and father-report temperament scores. Results are presented in Table 34. ANT interference was negatively related to father-report Inhibitory Control and, at trend level, to both Attention and overall Effortful Control. In addition, ANT interference was positively related to father-report Depressive Mood and, at the level of a trend, overall Negative Affectivity. Total Interference was related to father-report Depressive Mood at trend level.

TABLE 32. Pearson's Correlations – Adjusted Interference Scores and Self-Report Temperament, Genders Combined

	ANT Interference	*Stroop Interference*	*Emotion Interference*	*Total Interference*
Effortful Control	.12	.00	.09	.10
Activation Control	.11	.00	.14	.11
Attention	.10	-.08	-.00	.01
Inhibitory Control	.05	.07	.06	.10
Affiliativeness	-.06	-.06	-.00	-.08
Affiliation	-.07	-.12	-.03	-.14
Perceptual Sensitivity	-.12	-.04	.02	-.06
Pleasure Sensitivity	.05	-.01	.01	.01
Negative Affectivity	-.24*	-.06	-.02	-.14
Aggression	-.01	-.07	.04	.02
Depressive Mood	-.17+	-.10	-.00	-.13
Frustration	-.21*	.10	-.04	-.08
Surgency	.14	.09	-.05	.12
Fear	-.16	-.14	.03	-.15
High Intensity Pleasure	.07	.17	.04	.14
Shyness	-.09	.06	.10	.01

+ $p < .10$, * $p < .05$, ** $p < .01$.

TABLE 33. Pearson's Correlations - Adjusted Interference Scores and Mother-Report Temperament, Genders Combined

	ANT Interference	*Stroop Interference*	*Emotion Interference*	*Total Interference*
Effortful Control	-.24*	-.23*	-.14	-.31**
Activation Control	-.09	-.22*	-.02	-.16
Attention	-.20+	-.15	-.09	-.24*
Inhibitory Control	-.29**	-.18+	-.23*	-.36**
Affiliation	-.04	.09	-.08	.01
Negative Affectivity	.14	.21+	.22*	.30**
Aggression	.21+	-.23*	.14	.30**
Depressive Mood	.13	.19+	.19+	.26*
Frustration	-.04	.03	.14	.08
Surgency	-.15	.02	.11	-.01
Fear	.06	-.03	.04	.04
High Intensity Pleasure	-.16	.13	.15	.07
Shyness	.10	.09	-.12	.03

+ $p < .10$, * $p < .05$, ** $p < .01$

TABLE 34. Pearson's Correlations - Adjusted Interference Scores and Father-Report Temperament, Genders Combined

	ANT Interference	*Stroop Interference*	*Emotion Interference*	*Total Interference*
Effortful Control	-.30+	.08	-.05	-.11
Activation Control	-.11	.11	.04	.03
Attention	-.30+	-.01	.01	-.13
Inhibitory Control	-.39*	.10	-.18	-.21
Affiliation	-.20	-.15	.05	.03
Negative Affectivity	.28+	-.01	.13	.17
Aggression	.19	-.05	.16	.12
Depressive Mood	.42**	.14	.08	.29+
Frustration	.16	-.10	.09	.06
Surgency	-.12	-.11	.24	.02
Fear	.01	.05	-.26	-.11
High Intensity Pleasure	.01	.13	.25	.19
Shyness	.19	.24	-.02	.20

+ $p < .10$, * $p < .05$, ** $p < .01$

TABLE 35. Pearson's Correlations – CFCQC and Temperament
Genders Combined

	Parent Monitor	*Conflict*	*Risk Group*	*Problem Behavior*	*Prosocial Behavior*
Effortful Control	**.34****	**-.36****	-.05	**-.42****	**.39****
Affiliativeness	**.23***	.13	-.03	-.06	.30**
Surgency	-.07	.03	-.06	.16	.13
Depressive Mood	-.17	**.21***	.13	.15	-.10
Aggression	**-.36****	**.28****	**.23***	**.36****	**-.31****
Frustration	-.07	**.31****	.10	.15	-.00
M-Effortful Control	**.26***	**-.33****	-.14	**-.38****	**.21***
M-Affiliation	.14	-.09	.09	.01	.18
M-Surgency	.06	.09	.05	.04	.07
M-Depressive Mood	-.15	**.18+**	.01	.17	-.06
M-Aggression	-.17	**.25***	.05	.16	-.11
M- Frustration	-.07	.16	-.00	.07	-.03

M = parent-report
* $p < .05$, ** $p < .01$

TABLE 36. Pearson's Correlations - Adjusted Interference Scores, CFCQC, and Risk Group
Genders Combined

Scale	*ANT*	*Counting Stroop*	*Emotion Stroop*	*Total Interference*
Parental Monitoring	-.06	-.12	-.09	-.16
Parental Rules	.04	.16	-.05	.05
Family Conflict	.11	.14	.10	.15
Relationship Quality	.03	-.16	-.08	-.09
Deviant Peer Associations	**.21***	.13	**.21***	**.28****
Deviant Behaviors	**.27****	.12	.10	**.24***
Pro-social Peer Associations	.11	-.14	-.04	-.05
Pro-social Behaviors	.04	-.10	.04	.02
Risk Group	.15	**.19+**	**.19+**	**.30****

+ $p < .10$;* $p < .05$; ** $p < .01$

TABLE 37. Multiple Regression Analyses Dependent Variable: Problem Behavior Composite

Model 1	R^2	*Sig.*				*Beta*	*t*	*Sig.*
	.01	.464			Risk Group	.08	.18	.464
Model 2a	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.24	.000	.23	.000	Family Conflict	.31	2.88	.005
					Parental Monitoring	-.33	-2.67	.009
					Risk Group	.02	.17	.861
					Prosocial Behavior	.10	.85	.396
Model 2b	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.38	.000	.37	.000	Effortful Control	-.46	2.78	.007
					Mother Effortful Control	-.25	-2.72	.008
					Total Interference	.25	2.78	.007
					Surgency	.16	1.78	.079
Model 3	R^2	*Sig.*	$R^2\Delta$(a)	*Sig.*		*Beta*	*t*	*Sig.*
	.45	.000	.21	.000	Family Conflict	.17	1.73	.088
					Parental Monitoring	-.23	-2.10	.039
					Risk Group	-.10	-1.11	.270
					Prosocial Behavior	.19	1.75	.084
					Effortful Control	-.39	-4.09	.000
					Mother Effortful Control	-.19	-2.03	.046
					Total Interference	.27	2.95	.004
					Surgency	.09	1.07	.289

TABLE 38. Multiple Regression Analyses
Dependent Variable: Depressive Mood

Model 1	R^2	*Sig.*				*Beta*	*t*	*Sig.*
	.02	.172			Risk Group	.14	1.38	.172
Model 2a	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.06	.384	.04	.362	Family Conflict	.15	1.23	.223
					Parental Monitoring	-.01	-.07	.946
					Risk Group	-.137	1.25	.216
					Problem Behavior	.050	.41	.680
					Prosocial	-.03	-.20	.842
Model 2b	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.48	.000	.47	.000	Gender	.26	2.69	.009
					Effortful Control	-.34	-4.16	.000
					Affiliativeness	.23	2.67	.009
					Total Interference	-.03	-.40	.692
					Surgency	-.35	-4.48	.000
Model 3	R^2	*Sig.*	$R^2\Delta$(a)	*Sig.*		*Beta*	*t*	*Sig.*
	.52	.000	.46	.000	Family Conflict	-.01	-.09	.931
					Parental Monitoring	-.09	-.91	.368
					Risk Group	.05	.559	.578
					Problem Behavior	.11	1.12	.267
					Prosocial Behavior	-.06	-.53	.598
					Gender	.27	3.13	.002
					Effortful Control	-.26	-2.72	.008
					Affiliativeness	.25	2.86	.005
					Surgency	-.38	-4.53	.000
					Total Interference	-.09	-1.00	.598

Summary of Correlations

In general, self-reported Effortful Control was not related to attention interference. However, both mother- and father-reported Effortful Control showed a negative relationship with attention interference, indicating that poor performance on the tasks was associated with lower levels of parent-reported Effortful Control. Self-reported Negative Affectivity was somewhat negatively related to attention interference. However, parent-report Negative Affectivity was positively related to attention interference, indicating that poor performance on the tasks was associated with higher levels of negative affect. There was little relationship between Affiliativeness and attention and Surgency and Attention.

Temperament and Child and Family Center Questionnaire - Child Form (CFCQC)

Correlations between CFCQC scores and self- and mother-report temperament scores are reported in Table 35, and are summarized here by temperament scale.

Effortful Control

Parental Monitoring, and Relationship Quality were positively related to both self- and mother-report Effortful Control, while Parental Rules was also related to self-report Effortful Control. Family Conflict was negatively related to mother-report Effortful Control, and Deviant Peers and Deviant Behaviors were both negatively related to both self- and mother-report Effortful Control. Prosocial Peers and Prosocial Behavior

scores were positively related to self- report Effortful Control and, at trend level, to mother-report Effortful Control.

Affiliativeness

Parental Monitoring was positively related to self-report Affiliativeness and, at trend level, to mother-report Affiliativeness. No other significant relations were found between Affiliativeness and CFCQC scores.

Negative Affectivity

Parental Monitoring, Parental Rules, and Relationship Quality were all negatively related to self-reported Aggression, while Parental Monitoring and Relationship Quality were also negatively related to mother-report Aggression. Deviant Behavior and Deviant Peer scores were positively related to self-, but not mother-report of Aggression. In addition, Prosocial Behavior scores were negatively correlated with both mother- and self-reported Aggression. Risk Group was positively related to self-, but not mother-report of Aggression.

Relationship Quality and Parental Rules were both negatively related to self-report Depressive Mood. Deviant Behavior scores were related to self-reported Frustration, while Relationship Quality was negatively related to self-reported Frustration.

TABLE 39. Multiple Regression Analyses
Dependent Variable: Aggression

Model 1	R^2	*Sig.*				*Beta*	*t*	*Sig.*
	.08	.009			Risk Group	.27	8.70	.009
Model 2b	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.27	.000	.19	.000	Family Conflict	.07	.63	.530
					Parental Monitoring	-.05	-.43	.665
					Risk Group	.27	2.77	.007
					Prosocial Behavior	-.23	-2.02	.047
					Problem Behavior	.23	2.17	.033
Model 1b	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.26	.000	.18	.000	Effortful Control	-.43	-4.59	.000
					Mother Effortful Control	-.14	-2.41	.018
					Total Interference	-.05	-.51	.610
Model 2	R^2	*Sig.*	$R^2\Delta$(a)	*Sig.*		*Beta*	*t*	*Sig.*
	.36	.015	.09	.000	Family Conflict	.02	.18	.858
					Parental Monitoring	-.04	-.29	.775
					Risk Group	.27	2.85	.005
					Pro-Social Behavior	-.15	-1.26	.210
					Problem Behavior	.17	1.43	.155
					Self Effortful Control	-.26	-2.30	.024
					Mother Effortful Control	-.14	-2.30	.185
					Total Interference	.17	-1.65	.102

TABLE 40. Multiple Regression Analyses
Dependent Variable: Pro-Social Behavior Composite

Model 1	R^2	*Sig.*				*Beta*	*t*	*Sig.*
	.01	.450			Risk Group	.08	.76	.450
Model 2a	R^2	*Sig.*	$R^2\Delta$	*Sig.*		*Beta*	*t*	*Sig.*
	.38	.000	.37	.000	Family Conflict	-.17	-1.70	.092
					Parental Monitoring	.56	5.54	.000
					Risk Group	.16	1.83	.070
					Problem Behavior	.08	.85	.396
Model 2b	R^2	*Sig.*	$R^2\Delta$	*Sig.*		***Beta***	*t*	*Sig.*
	.23	.000	.21	.000	Effortful Control	.45	4.62	.000
					Mother Affiliation	.24	2.52	.014
					Total Interference	-.06	-.61	.543
Model 3	R^2	*Sig.*	$R^2\Delta$(a)	*Sig.*		*Beta*	*t*	*Sig.*
	.45	.000	.07	.000	Family Conflict	-.12	-1.25	.215
					Parental Monitoring	-.23	-2.10	.039
					Risk Group	.17	1.99	.050
					Problem Behavior	.19	1.75	.084
					Effortful Control	.31	3.06	.003
					Mother Affiliation	.13	1.54	.128
					Total Interference	-.09	-1.01	.316

TABLE 41. Pearson's Correlations – CFCQC and Temperament
Females

	Parent Monitor	*Conflict*	*Risk Group*	*Problem Behavior*	*Prosocial Behavior*
Effortful Control	**.30***	**-.31***	-.09	**-.35****	**.26+**
Affiliativeness	**.23+**	.10	-.12	.03	.33+
Surgency	-.19	.21	-.00	**.29***	.09
Depressive Mood	-.12	.18	.11	.16	-.04
Aggression	**-.32***	**.25+**	**.24+**	**.36****	-.22
Frustration	-.04	.19	.13	.07	.04
M-Effortful Control	.18	**-.34***	-.00	**-.35****	.20
M-Affiliation	.13	.05	.08	.02	.06
M-Surgency	-.12	.23	.15	.05	-.03
M-Depressive Mood	-.10	.16	-.01	.20	-.06
M-Aggression	-.13	**.27***	-.06	.04	-.11
M- Frustration	.07	.09	-.19	-.10	.09

M = Mother-report
* $p < .05$, ** $p < .01$

TABLE 42. Pearson's Correlations – CFCQC and Temperament
Male

	Parent Monitor	*Conflict*	*Risk Group*	*Problem Behavior*	*Prosocial Behavior*
Effortful Control	**39***	**-.43****	-.04	**-.51****	**.55****
Affiliativeness	.23	.19	-.12	-.11	.18
Surgency	.15	**-.29+**	-.04	-.12	.27+
Depressive Mood	**-.35***	**.33***	-.06	**.30+**	**-.40***
Aggression	**-.43****	**.33***	.24	**.36***	**-.44****
Frustration	-.14	**.50****	.01	**.30+**	-.10
M-Effortful Control	**.35***	**-.33***	**-.37***	**-.40***	.18
M-Affiliation	.15	-.34	.03	.04	.29+
M-Surgency	.31+	-.12	.04	-.02	.27
M-Depressive Mood	-.30+	.25	-.11	.21	-.19
M-Aggression	-.23	.21	.19	.31+	-.10
M- Frustration	-.24	**.27+**	**.29+**	.26	-.12

M = Mother-report
* $p < .05$, ** $p < .01$

Surgency

Self-reported Surgency was positively related to Prosocial Behavior scores. Mother-reported Surgency was negatively related to Relationship Quality at trend level.

General Summary of Correlations

In general, both self- and parent-report Effortful Control were positively related to positive parenting, relationship, and prosocial behavior scores, and negatively related to problems with deviant peers and behaviors. Depression, Frustration, and Depressive mood were all negatively related to Relationship Quality. Aggression and Depressive Mood were also negatively related to Prosocial Behaviors.

Self-reported Surgency was associated with self-reported Prosocial Behaviors, but mother-reported Surgency was related to Family Conflict. Affiliativeness was associated with Parental Monitoring.

Attention Tasks and Child and Family Center Questionnaire - Child Form

Relationships between adjusted interference scores and CFCQC scores are presented in Table 36. Risk Group is also included. Deviant Behavior scores were positively related to ANT Interference and the Total Interference score. Deviant Peer Relation scores were positively related to ANT, Emotion, and Total Interference Scores. In addition, Risk Group was positively associated with Total Interference Scores and, at trend level, with Emotion and Counting Interference scores.

Multivariate Analyses

As Deviant Peer and Deviant Behavior scores were highly correlated, multivariate ANOVA was performed to examine the effect of CFCQC, temperament, and risk group variables on the combined set of dependent variables. Three separate analyses were run; the first examined Risk Group alone, as middle school Risk Group had been predicted to be indicative of future deviant activities. However, Risk Group was not related to the combined set of variables ($F(4, 184) = 1.44$, *ns*).

In the second analysis, the remaining CFCQC variables were used. The multivariate test revealed that Parental Monitoring was significantly related to the combined set of deviant behavior variables ($F(2, 88) = 4.19$, $p < .05$), as were, at trend level, both Relationship Quality ($F(2, 88) = 2.88$, $p = .06$) and Parental Rules ($F(2, 88) = 2.90$, $p = .06$). Univariate tests revealed Parental Monitoring to be significantly related to Deviant Behaviors ($F(1, 89) = 8.42$, $p < .05$) and, at trend level, to Deviant Peer Relations ($F(1, 89) = 3.58$, $p = .06$). In addition, Parental Rules was related to Deviant Peer Relations ($F(1, 89) = 5.169$, $p < .05$). Relationship Quality was related to Deviant Behaviors ($F(1, 89) = 5.75$, $p < .05$) and, at trend level, to Deviant Peer Relations (F(1, 89) = 3.58, $p = .06$). Overall, $R^2 = .273$ for Deviant Behaviors, and .284 for Deviant Peer Relations.

In the third analysis, temperament variables were used. Multivariate tests revealed a significant relationship between self-reported Effortful Control and the combined set of dependent variables ($F(2, 69) = 6.12$, $p < .01$). In addition, self-reported Affiliation was related to the combined set of variables at the level of a trend ($F(2, 69) =$

2.54, $p = .09$). Examination of univariate results revealed that self-reported Effortful Control was related to both Deviant Behaviors ($F(1, 70) = 11.97$, $p < .01$) and to Deviant Peer Associations ($F(1, 70) = 8.52$, $p < .01$), while self-reported Affiliation was only related to Deviant Behaviors ($F(1, 70) = 3.20$, $p = .08$). Overall, $R^2 = .446$ for Deviant Behaviors, and .392 for Deviant Peer Relations.

Regression Analyses to Predict Psychosocial Outcomes

The multivariate analyses indicated that, overall, the set of individual difference variables was more highly related to Deviant Behavior and Deviant Peer scores than was the set of CFCQC variables, as indicated by R^2. To understand better the relative contribution of CFCQC, risk, temperament, and attention variables to psychosocial outcomes when examined together, a series of regression analyses were performed. However, the ratio of variables to subjects was too high to include all variables studied. In addition, the inclusion of both Deviant Peer and Deviant Behavior scores as predictors of other variables would have created problems with collinearity. Therefore, a series of steps were taken before regression analyses were performed.

First, CFCQC variables were combined as follows: a mean of Deviant Peers and Deviant Behavior scores was calculated and combined to form a Problem Behavior Composite; a mean of Prosocial Peers and Prosocial Behavior Scores was calculated and combined to form a Prosocial Behavior Composite; a mean of Parental Monitoring and Parental Rules was calculated and named Parental Monitoring/Rules; and a mean of Family Conflict and reverse-scored Relationship Quality scores was calculated and labeled Family Conflict/Relationships.

Next, a series of regressions were conducted in which all temperament scores and gender were entered to predict scores on 1) Problem Behavior; 2) Prosocial Behavior; 3) Aggression; and 4) Depressive Mood. Only those variables predicting significant variance in the dependent variables were retained for further analysis. For each of the four dependent variables, hierarchical regression was performed with Risk Group entered in one block, CFCQC composite variables entered as another set of variables, and Total Interference and appropriate temperament scores, along with gender (if applicable) as a third set of variables. The variables within each group were entered simultaneously. Two regression analyses were conducted for each dependent variable; the first contained Risk Group in the first block, CFCQC variables in the second block (2a), and temperament, Total Interference scores and gender (if applicable) in the third block. The second regression for each variable contained Risk Group in the first block, temperament, Total Interference, and gender (if applicable) in the second block (2b), and CFCQC variables in the third.

Problem Behavior Composite

Results for the Problem Behavior Composite are presented in Table 37. For the first regression, Risk group did not predict significant variance in Problem Behavior scores. However, Block 2 variables (CFCQC) were significant ($r^2 = .24$, $r^2 \Delta = .24$, $F \Delta (3, 85) = 5.66$, $p < .001$). Examination of standardized Beta weights revealed that both Parental Monitoring/Rules ($t = -2.67$, $p < .01$) and Family Conflict/Relationships ($t = 2.87$, $p < .01$) made significant contributions to the prediction of Problem Behavior scores.

When Block 3 variables were entered, significant additional variance was gained ($r^2 \Delta = .21$, *F Change* (4, 81) = 7.589, $p < .001$). The overall model remained significant ($r^2 = .45$, $F(8, 81) = 8.29$, $p < .001$). While Parental Monitoring still contributed significant variance, Family Conflict dropped to trend level. Both self-report Effortful Control ($t = -4.09$, $p < .001$) and mother-report Effortful Control ($t = -2.02$, $p < .05$) contributed significantly to prediction of Problem Behavior scores, as did Total Interference ($t = 2.948$, $p < .01$). The Pro-social composite measure contributed variance as well ($t = 1.75$, $p = .08$), but only at trend level. The direction of this relationship indicated that Pro-social and Problem Behavior scores were positively related when controlling for the additional variables in the model.

TABLE 43. Pearson's Correlations – Adjusted Interference Scores, CFCQC, and Risk Genders Combined

	Parent Monitor	*Conflict*	*Risk Group*	*Problem Behavior*	*Prosocial Behavior*
ANT	-.07	-.03	.15	.30**	.13
Stroop	-.02	.16	.19+	.13	-.14
Emotion	-.12	.09	.19+	.20+	.01
Total	-.13	.10	.30**	.30**	-.01

+ $p < .10$, * $p < .05$, ** $p < .01$

TABLE 44. Pearson's Correlations – Adjusted Interference Scores, CFCQC, and Risk
Females

	Parent Monitor	*Conflict*	*Risk Group*	*Problem Behavior*	*Prosocial Behavior*
ANT	-.01	.00	.08	.44**	.18
Stroop	-.15	.16	.27*	.26+	-.25+
Emotion	-.14	.12	.27*	.19	-.08
Total	-.14	.10	.31*	.38**	-.09

+ $p < .10$, * $p < .05$, ** $p < .01$

TABLE 45. Pearson's Correlations – Adjusted Interference Scores, CFCQC, and Risk
Males

	Parent Monitor	*Conflict*	*Risk Group*	*Problem Behavior*	*Prosocial Behavior*
ANT	-.16	-.08	.27	.08	.07
Stroop	.15	.18	.11	-.02	-.03
Emotion	-.09	.04	.12	.22	.14
Total	-.11	.09	.30+	.19	.11

+ $p < .10$, * $p < .05$, ** $p < .01$

Regression 2 for Problem Behavior was then conducted. Block 2a variables (temperament and Total Interference) were significant ($r^2 = .38$, $F(4, 85) = 13.13$, $p < .001$). Self-report Effortful Control ($t = -5.21$, $p < .001$), mother-report Effortful Control ($t = -2.72$, $p < .01$) and Total Interference ($t = 2.78$, $p < .01$) all contributed significantly to prediction of Problem Behavior scores, as did Surgency ($t = 1.78$, $p = .08$), but only at the level of a trend. After entry of the second block of variables, the model was identical to that in regression 1.

Depressive Mood

Results for self-report Depressive Mood are presented in Table 47. For the first regression, Risk Group did not significantly predict Depressive Mood. The addition of Block 2 (CFCQC) variables did not add significantly to the prediction of Depressive Mood scores. When Block 3 variables were entered, significant additional variance was gained ($r^2 \Delta = .46$, *F Change* $(7, 77) = 11.67$, $p < .001$). The overall model then became significant ($r^2 = .52$, $F(12, 77) = 7.71$, $p < .001$). Examination of standardized beta weights revealed self-report Effortful Control ($t = -2.72$, $p < .05$), self-report Affiliativeness ($t = 2.86$, $p < .05$), self-report Surgency ($t = -4.53$, $p < .001$), and Gender (being female) ($t = 3.13$, $p < .01$) all contributed significantly to prediction of Depressive Mood.

Regression 2 for Depressive Mood was then conducted. Block 2b variables (temperament and Total Interference) were significant ($r^2 = .48$, $F(6, 82) = 13.40$, $p < .001$). Self-report Effortful Control ($t = -4.16$, $p < .001$), Affiliativeness ($t = 2.67$, $p < .01$), and Surgency ($t = -4.48$, $p < .001$), as well as Gender ($t = 2.69$, $p < .001$),

contributed significantly to prediction of Depressive Mood scores. After entry of the second block of variables, the model was identical to that in regression 1a.

Aggression

Results of the regression analyses to explain self-report Aggression scores are presented in Table 39. For regression 1, Risk Group predicted significant variance in Aggressive Mood scores ($r^2 = .08$, $F(1, 88) = 7.17$, $p < .01$). Block 2 variables added significantly to the prediction of Aggression scores ($r^2 \Delta = .20$, $F \Delta (4, 84) = 5.67$, $p < .001$)). Examination of standardized Beta weights revealed that Prosocial Composite scores ($t = -2.02$, $p < .05$), and Behavior Problem scores ($t = 2.17$, $p = .03$) made a significant contribution to the prediction of self-reported Aggression scores, such that Problem Behavior scores were positively related to Aggression and Prosocial behavior was negatively related to Aggression scores.

When Block 3 variables were entered, small but significant additional variance was gained ($r^2 \Delta = .09$, $F \Delta (3, 81) = 3.70$, $p < .05$). The overall model remained significant ($r^2 = .36$, $F(7, 82) = 5.68$, $p < .001$). While Risk Group still contributed significant variance, Prosocial and Problem Behavior did not. Self-report Effortful Control ($t = -2.29$, $p < .05$) contributed significantly to prediction of Aggression scores.

Regression 2 for Aggression was then conducted. Block 2b variables (temperament and Total Interference) were significant ($r^2 = .26$, $F(3, 86) = 10.09$, $p < .001$). Self-report Effortful Control ($t = -4.59$, $p < .001$), and mother-report Effortful Control ($t = -2.41$, $p < .05$) both contributed significantly to the prediction of Aggression

scores. After entry of the second block of variables, the model was identical to that in regression 1.

Prosocial Composite

Results of the regression analyses to explain self-report Prosocial Behavior scores are presented in Tables 40. For regression 1, Risk Group did not predict significant variance in Prosocial Composite scores. Block 2 variables were significant ($r^2 \Delta = .21$, $F \Delta (3, 85) = 7.60$, $p < .001$). Examination of standardized Beta weights revealed that Parental Monitoring ($t = 5.54$, $p < .001$) made a significant contribution to the prediction of self-reported Prosocial behavior scores, as did both Family Conflict ($t = -1.70$, $p = .09$), and Risk Group ($t = 1.84$, $p = .07$), such that Family Conflict was negatively related to Prosocial behavior, while Risk Group was positively related.

When Block 3 variables were entered, small but significant additional variance was gained ($r^2 \Delta = .07$, $F \Delta (3, 82) = 3.47$, $p < .05$). The overall model remained significant ($r^2 = .45$, $F(7, 82) = 9.57$, $p < .001$). All three significant predictors from Block 2 remained significant. In addition, self-report Effortful Control was positively related to Prosocial Behavior scores ($t = 3.06$, $p < .01$).

Regression 2 for Prosocial Behavior was then conducted. Block 2b variables (temperament and Total Interference) were significant ($r^2 = .23$, $F(3, 86) = 8.38$, $p < .001$). Self-report Effortful Control ($t = 4.62$, $p < .001$), and mother-report Affiliation ($t = 2.51$ $p < .05$) both contributed significantly to explanation of Prosocial behavior scores. After entry of the second block of variables, the model was identical to that in regression 1.

Figure 14 illustrates the additive nature of the relationship between parenting, Effortful Control, and problem behaviors. Low Parental Monitoring represents the bottom 25% of scores on the variable, high Parental Monitoring represents the top 25%;

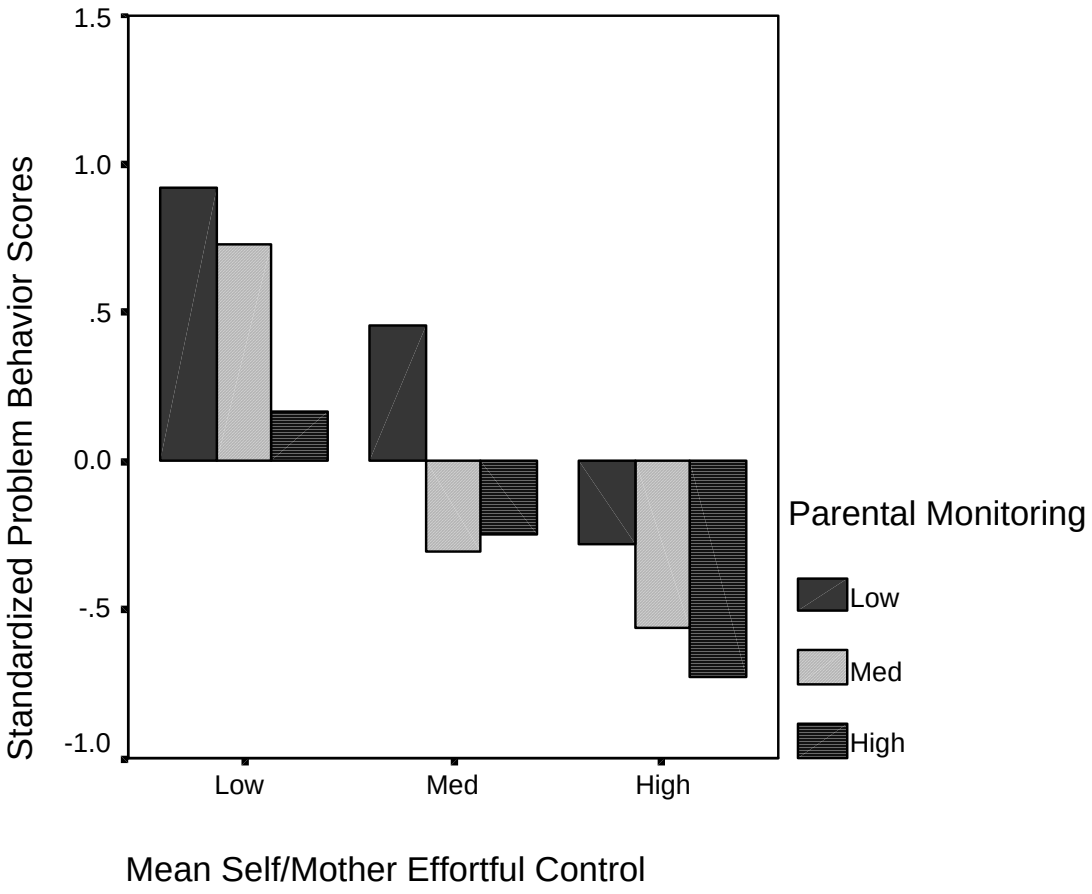


FIGURE 14. Standardized Problem Behavior Scores
by Levels of Effortful Control and Parental Monitoring

the remainder of the scores are categorized as medium Parental Monitoring. Self- and mother-report Effortful Control scores were combined, then categorized into 3 groups as well. As illustrated, participants with both low levels of Parental Monitoring and low levels of Effortful Control were particularly likely to participate in problem behaviors. However, individuals high in Effortful Control with high Parental Monitoring showed the lowest overall levels of problem behaviors.

Discussion

The primary goals of the current study were: 1) To examine the relationship between performance on tasks measuring executive attention and parent- and self-report Effortful Control; and 2) To examine the relative contribution of temperament, executive attention, and parenting, family, and risk variables to depressive mood and aggression, as well as to pro- and anti-social behaviors. Secondarily, the current study allowed additional replication and extension of findings regarding the psychometric properties of the EATQ-R, specifically when used with a diverse sample of older adolescents. Each of these goals will be discussed, followed by a summary discussion.

EATQ-R

Co-efficient alpha for scales and subscales in Study 2 were comparable, although slightly lower, to those found in Study 1. Co-efficient alpha for the Inhibitory Control subscale was, again, low, indicating that the subscale may require additional revision.

Agreement between reporters was also lower in Study 2 (.02 - .35, mean level of agreement: .21) than in Study 1 (.29 - .53, mean level of agreement: .40), and was

somewhat lower than expected from previous studies (Capaldi & Rothbart, 1992; Ellis & Rothbart, 2002). Again, this may reflect a difference in age between the current sample and the younger samples used in previous studies, as Achenbach et al. (1987) report that agreement between reporters is significantly higher for 6- to 11-year-olds than for older adolescents.

The level of agreement for Depressive Mood in Study 2 was higher than would have been expected from previous studies (Capaldi & Rothbart, 1992; Ellis & Rothbart, 2002). This level of convergence was almost entirely due to agreement between females and their mothers (.45 vs. .04 for males). This suggests that mothers may be more aware of internalizing emotion in daughters than in sons, perhaps due to a greater female tendency to verbalize emotion, as has been suggested in studies of adolescent emotion (e.g., (Larson & Richards, 1994). Father/self agreement for Depressive Mood was also relatively high in Sample 2 (.39); however, too few fathers responded to allow comparison of father/daughter versus father/son dyads. In addition, mother/father agreement in Sample 2, while relatively good for both Depressive Mood and Aggression, was much higher for the former (.74) than for the latter (.46). This finding is not in agreement with the Achenbach et al. (1987) analyses, who found better agreement between raters on measures of externalizing, versus internalizing behaviors.

Another interesting area of agreement and disagreement involved ratings of Frustration. While mother/self Frustration ratings in Study 1 showed moderate agreement (.30), agreement in Study 2 was near zero (.02). Further, there were no significant overall differences between ratings of self- and parent-report Frustration in males, and a statistically significant but fairly small difference between ratings of self-

and parent-report Frustration in females. This suggests that direction of disagreement between self- and parent-report for Study 2 participants was not systematic; some participants reported themselves higher in Frustration than did their parents, while others reported themselves lower. Agreement between parent-reporters was moderate (.40). The Frustration subscale showed good internal reliability in Study 2 for both self- (.82) and parent-report (.74). Thus, there is no obvious explanation as to why convergence between self- and parent-report was so poor.

Agreement for Effortful Control subscales was also substantially higher for Study 1 than for Study 2, particularly with regard to Activation and Inhibitory Control, although the poor convergence for the latter was primarily for females. While Study 1 participants consistently reported themselves as higher in Effortful Control and its subscales than did their parents, again there was no systematic pattern of differences between parent- and self-report in Study 2 with regard to Activation and Inhibitory Control. However, agreement between parent-reporters in Study 2 was quite high for Effortful Control (.75). Again, there is no obvious explanation as to the reason for the poor convergence.

Agreement between raters tended to be somewhat higher for female participants in this sample than for males. Additionally, preliminary examination of agreement between raters by ethnicity indicated that agreement was higher for European-American participants than for African-American participants. However, proportionally more of the at-risk and high-risk participants assessed thus far are African-American; thus, this finding may be confounded with risk group. Further, sample sizes by ethnicity and risk group were too small to allow adequate analyses to determine if this was the case. Therefore, the results of this line of inquiry are not reported.

While level of agreement between reporters differed from Study 1 to Study 2, the relationship between scale scores was, for the most part, similar for both. Parent-report Surgency and Affiliation were positively related in Study 2, while self-report Surgency and Affiliation were not, just as in Study 1. However, self-report Affiliation and Depressive Mood were positively related in Study 2 participants, replicating a finding from our original EATQ-R study (Ellis & Rothbart, 2002). Possible reasons for this relationship were discussed in Study 1; however, Affiliation and Depressive Mood were not related in parent-report (.04), again suggesting that the construct of Affiliation, as operationalized in our measure, is quite different for adolescents than for their parents. Further, Affiliation and Frustration were positively related in Study 2, but not in Study 1. This relationship may be due to the positive relationship of both to Depressive Mood. The pattern of relationships for the remaining self-report scales was quite similar in both studies; only the strength of the relationships differed.

In sum, internal reliabilities for the EATQ-R in Studies 1 and 2 were similar to those found in our original EATQ-R study, with the exception of Inhibitory Control. Further, the relationships between scales were similar across the three studies, suggesting a relative degree of consistency in patterns of relationships amongst temperament variables.

Attention Tasks

Analysis of ANT performance in Study 2 showed results very similar to those seen in adults (Fan et al., 2002). Incongruent flankers resulted in significantly longer RTs than did congruent flankers across warning cue types (mean RT interference = 114

ms) as seen in adults (mean RT interference = 130 ms) and in children (mean RT interference = 153 ms), while Alerting scores (mean alerting = 22 ms) were similar to adult subjects (mean alerting = 34 ms) and less than that seen in 10-year-olds (mean alerting = 76 ms). Orienting scores (mean orienting = 41 ms) were similar to those seen in adults (mean orienting = 66 ms) and 10-year-olds (mean orienting = 64 ms). Further, while overall reaction times (mean RT = 629 ms) were somewhat longer than those seen in adults (mean RT = 550 ms), and somewhat shorter (mean RT = 699 ms) than those seen in 10-year-olds (Rueda & Posner, 2002**???**). Additionally, the Interference, Alerting, and Orienting effects were not related within subjects with genders combined (see Table **??**); however, Alerting and Orienting were related in females. This has not been observed in other samples, and needs replication before we can speculate that a true gender difference exists.

Another gender difference in the present study that has not been observed in other samples was the significantly lower RTs for males than for females. However, after removal of five subjects who demonstrated unusually quick reaction times in combination with an unusually high number of errors, the difference was no longer significant, suggesting that the difference was an artifact of rapid, but inaccurate, performance on the part of a handful of male participants.

These results suggest that, even though the task was performed outside of a laboratory setting in varying environments, the effects of the ANT are evident even in less than ideal testing conditions. Tasks such as the ANT may prove to be appropriate for wide scale administration and need not be confined to small samples in the laboratory.

This could potentially prove beneficial in screening for difficulties in the executive attention system.

Analyses of Counting and Emotion Stroop task data were also, for the most part, as expected. Number trials reliably produced longer RTs than did neutral trials, indicating a conflict effect. However, Emotion Interference tended to be normally distributed around zero, indicating that many participants actually had faster RTs for emotional than for neutral trials. This unexpected finding was intriguing, suggesting that emotional stimuli may act as an alerting signal for many individuals. Indeed, Emotion Interference scores were negatively related to ANT Alerting scores, primarily for females, suggesting that those individuals who most benefited from the alerting cue in the ANT task were also quicker to respond to emotion stimuli.

The meaning of this finding is unclear; however, it may suggest that, for many females, emotional stimuli are very salient but are not necessarily troubling, causing a "jolt" to attentional systems. However, for others, emotional stimuli may serve to capture attention, resulting in the longer reaction times seen in individuals with anxiety disorders. Interestingly, the Alerting Effect was positively related to self-report Effortful Control in females; however, it was not related to parent-report Effortful Control nor was there any relationship in males.

Recoding of interference scores to include both RTs and errors revealed a relationship between ANT and Counting Stroop Interference. This is theoretically important, as the two tasks have been shown to activate similar regions of ACC (Bush, Luu, & Posner, 2000). Emotion Interference, on the other hand, was not related to ANT Interference and showed only a marginally significant relationship to Counting Stroop

Interference. Again, this is of theoretical interest, in that Emotional Stroop tasks have been shown to activate a slightly different region of ACC than have more "cognitive" Stroop tasks. However, examination of correlations by gender revealed that, for males, scores for the three interference tasks were not related and ANT and Emotion Interference scores were negatively related. However, for females, ANT and Counting Stroop Interference were related, as were Counting and Emotion Interference. These gender differences are intriguing and suggest the importance of further investigation. However, replication of such a finding is important before a true gender difference can be assumed.

Temperament and Attention

With genders combined, adjusted ANT Interference was negatively related to self-report Depressive Mood and Frustration. In addition, ANT and Counting Stroop Interference were positively related to mother-report Aggression, and negatively related to mother-report Effortful Control. Counting and Emotion Interference were both positively related to mother-report Depressive Mood. In addition, the Total Interference score was positively related to mother-report Aggression and Depressive Mood, and negatively related to mother-report Effortful Control.

While the relationship between mother-report Effortful Control and adolescent task performance is in keeping with our work with toddlers, there was not a significant agreement between self-report Effortful Control and task performance. This may indicate that mothers are better reporters of self-regulation than are adolescents themselves, at least in the current sample. Mother-report of Negative Affectivity was also positively

related to interference scores, again, in keeping with our hypothesis, whereas self-report Negative Affectivity in males was negatively related to attention interference. Again, this may suggest that mothers are better reporters of dimensions of temperament at this age than are adolescents.

In sum, these findings provide an interesting link between functioning of the executive attention system and mother-report measures of self-regulation and emotion. We have found a similar relationship between mother-report temperament and toddler performance on executive attention tasks in two separate studies in our laboratory. To find similar results across such samples that differ so greatly in age suggests that results of these tasks may, indeed, serve the role of markers of functioning of neural areas important in self-regulation.

In addition, to find agreement between measures that vary substantially in methodology not only speaks to the validity of both measures, but supports the use of parent-report measures of temperament as relatively objective accounts of individual differences in children and adolescents. Both mother- and father-report temperament related not only to each other, but to task performance in the hypothesized direction. This suggests that both mothers' and fathers' accounts of their children's behaviors and temperaments may provide valuable information regarding biologically based individual differences.

Attention, Parenting, Risk, and Problem Behavior Variables

Adjusted interference scores were also related to risk group and CFCQC Deviant Behavior and Deviant Peer scores. Specifically, ANT and Emotion Interference, as well

as Total Interference scores were both related to Deviant Peer Scores, and ANT and Total Interference scores were related to Deviant Behavior. Counting and Emotion Interference were related to risk group, such that individuals in higher risk groups had higher Counting and Emotion Interference scores. Indeed, univariate ANOVA revealed a significant main effect of risk group for Total Interference scores.

These relationships suggest the importance of measuring attention regulation in adolescents. That scores predict self-report association with deviant peers and involvement in deviant behaviors and distinguish between groups seen as "At Risk" by teacher ratings made three years previously gives some evidence of the validity of the approach. However, poor task performance, Problem Behavior, and teacher ratings of risk could all reflect a general tendency for noncompliant behavior that is less reflective of actual functioning of neural systems and more reflective of differences in levels of rebellion.

Temperament, Parenting, Risk, and Problem Behavior Variables

Both self- and parent-report Effortful Control were positively related to self-report Parental Monitoring, Parental Rules, and Prosocial Behavior in this sample, and negatively to Family Conflict and Deviant Peer Relations and Deviant Behaviors. Self-reported Depressive Mood, Aggression, and Frustration were all related to Family Conflict, as were parent-report Depressive Mood and Aggression. Further, self-report Aggression was related to risk group rating.

That Effortful Control and parenting variables are positively related is not surprising. Parenting is often found to covary with child characteristics (Putnam et al., in

press), thus suggesting that it may be easier to monitor children with good Effortful Control. However, involved and conscientious parenting may also produce children with good self-regulation. An additional explanation, however, is that the influence between parents and children is bi-directional, with parent characteristics influencing children's behavior and children's behavior influencing the behavior of parents. This interpretation is supported by empirical research (e.g., Bates, Pettit, Dodge, & Ridge, 1998; Kochanska, 1997; Patterson, DeBaryshe, & Ramsey, 1989; van den Boom, 1994). Early temperamental characteristics may "set in motion a chain of reactions from others that put children at risk or protect them from developing behavior and psychological problems" (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000, p. 222). The current study does not allow examination of this process; such examination is only possible via careful, longitudinal research.

Of additional interest is the prospect that passive gene-environment correlation may account for the relationship between parenting variables and child effortful control. A passive gene-environment correlation exists when similar behaviors between parents and children exist because both are genetically related (Deater-Decker, 2000). We may posit that consistent, planful parenting that includes monitoring, rule making, and a positive relationship, may be due to high levels of effortful control on the part of the parent. In this sense, then, we can think of parenting variables as a proxy for parent effortful control. However, as parent effortful control was not measured in the present study, it is not possible to test this hypothesis directly.

Temperament, Attention, Parenting Variables and Psychosocial Outcomes

Regression analyses to examine variance in scores on psychosocial behaviors yielded results consistent with those hypothesized. Parental Monitoring/Rules, self- and mother-report Effortful Control, and Total Interference scores all contributed significantly to the explanation of variance in Problem Behavior scores. Further, there were no significant interaction effects, indicating that effects of each were independent and additive. Within each level of Effortful Control, for example, Parental Monitoring had an effect. Further, within each level of Parental Monitoring, Effortful Control had an effect, and so on. Thus, participants with poor Effortful Control, poor executive attention skills, and poor Parental Monitoring had particularly high problem behavior scores.

However, it appears that parenting and family variables were partially mediated through their relationship with individual difference measures. Parental Monitoring/Rules and Family Conflict were both significantly related to Problem Behavior scores when entered in the first block. However, when individual difference measures were entered, the role of Family Conflict was somewhat diminished as was, to a lesser degree, the association with Parental Monitoring/Rules. When individual difference measures were entered first, the effects of self- and mother-report Effortful Control were diminished slightly when family and risk variables were entered, but the contribution of Total Interference actually increased. While both individual difference measures alone ($r^2 = .38$) and family and risk variables alone ($r^2 = .24$) predicted significant variance in problem behavior scores, inclusion of both sets of variables

provided a much more complete understanding of the processes involved in such behavior than did either set alone.

Interestingly, family and risk variables did not predict significant variance in Depressive Mood scores above and beyond that predicted by individual difference measures alone. This finding suggests that Depressive Mood may be more closely related to internal states than to environmental factors. This interpretation would be consistent with a more biologically based interpretation of depression, rather than an interpretation which views depression as a reactive process triggered by environmental factors. However, relationship issues have repeatedly been associated with depression (Frank & Young, 2002). While relationship issues were not measured in the current study, the relation of Affiliativeness to Depressive Mood may reflect the importance of relationship issues.

Total Interference scores did not contribute significantly to Depressive Mood scores, nor did Emotion Interference as hypothesized. It is unclear why the hypothesized relationship was not found. Further studies might include variants of emotional interference tasks to understand better any possible role of executive attention in depression.

Parental Monitoring/Rules and Family Conflict did not predict significant variance in Aggression scores, as would have been suggested by Patterson et al.'s theory (1992). However, Prosocial scores were negatively related to Aggression, and Problem Behavior scores, along with risk group, were positively related to Aggression. It was rather surprising that family variables did not contribute directly to the prediction of Aggression scores; however, partial correlations revealed that the relationships between

family variables and Aggression were mediated, in part, through their relationships with Prosocial and Problem Behaviors.

Interestingly, individual difference variables contributed less to the prediction of Prosocial behaviors than did family and risk group variables. Surprisingly, while Parental Monitoring/Rules and Family Conflict were related to Prosocial Behavior scores in a direction that one would predict, both risk group and (after entering individual difference variables) Problem Behavior were positively related to Prosocial Behavior scores. This relationship indicates that, after controlling for individual differences in Effortful Control, the same individuals engaging in problem behaviors are also engaging in prosocial behaviors. In addition, this pattern is related to risk group. This may be due in part to the type of questions asked in the prosocial composite, many of which involve participation in group activities. Perhaps adolescents are more likely to both behave and misbehave when in a group; indeed, prosocial preschoolers also tend to exhibit aggressive behaviors.

Fabes et al. (1999) in a meta-analysis of data focusing on the development of prosocial behavior, found such behaviors to increase during adolescence. However, very little work has been done with respect to temperament and prosocial behaviors in adolescence. Further, Fabes and colleagues suggest that the concurrent examination of both prosocial and antisocial behaviors is necessary, as examination of one without the other "presents a skewed and limited description of the complexity of adolescents" (p.13). As such, additional work in these areas may be valuable.

In Sum, Study 2 provided partial support for our hypotheses. Performance on attention tasks was positively related to Effortful Control and negatively related to

Negative Affectivity, but only for parent-report. This suggests that the aspects of temperament related to executive attention may be better assessed by parent-report in this age group than by self-report. This finding will need to be replicated in additional samples. In addition, parenting variables, self-regulation, and attention all contributed significant variance to explanation of problem behaviors as had been hypothesized, although Surgency did not. Further, risk group did not contribute significant variance.

Attention scores did not contribute significantly to explanation of Depressive Mood or Aggression, although temperament variables did. Further, the pattern of temperament variables predicting Depressive Mood and Aggression were similar to those found in Study 1, including the role of Affiliativeness in Depressive Mood. Individual difference scores did not add significantly to the prediction of prosocial behavior scores. The reason for this finding is not immediately clear.

The general pattern of findings suggests the importance of self-regulation, as assessed by both questionnaire and laboratory measures, in psychosocial outcomes, particularly with regard to deviant peer relationships and behaviors. These findings are in agreement with work by Giancola and others reporting deficits in executive functioning in adolescents involved in delinquent behaviors. Further, these findings suggest that the link between executive functioning and delinquent behavior may be via Effortful Control, as suggested by our laboratory findings in this study as well as our studies with toddlers (Gerardi-Caulton, 2002; Rothbart et al., in press). However, self- and mother-report Effortful Control scores and Total Interference scores all three predicted significant variance in Problem Behavior scores, suggesting that each also measure unique aspects of self-regulation important in our understanding of adolescent behavior.

In addition, the findings suggest that effective parenting and self-regulation go hand-in-hand in predicting outcomes. These findings are consistent with current theory (e.g., Collins et al., 2001) highlighting the importance of both genes and environment in child outcomes and, again, underscore the importance of measurement of both types of variables in developmental studies.

CHAPTER IV

CONCLUSIONS

Overview

Two studies were designed to investigate the role of individual differences in adolescent psychosocial development, including temperament, attention, and puberty, and to relate temperamental Effortful Control to functioning of the executive attention system. Study 1 sought to: 1) Examine possible relationships between temperament and puberty in early adolescence; and 2) Examine possible contributions of temperament and puberty to psychosocial outcomes in early adolescence. Study 2 sought to: 1) Measure and examine possible relations between executive attention, temperament, and family variables; and 2) Examine relative contributions of executive attention, temperament, and risk, parenting, and family variables to psychosocial outcomes. Both studies allowed further exploration of the psychometric properties of the EATQ-R.

Relations were found between temperament and puberty, with puberty associated with an increase in aspects of negative affectivity. Further, it appears that puberty may be associated with decreases in self-regulation. In connection with temperament and psychosocial outcomes, we replicated in Study 1 our previous finding (Ellis & Rothbart,

2002) relating poor effortful control to both aggression and depressive mood, as well as a positive relationship between affiliation and depressive mood. In addition, we found relationships between performance on measures of executive attention and parent-, but not self-reported temperament in Study 2, such that relatively poor performance on the tasks was related to lower levels of mother-report Effortful Control and higher levels of mother-report Negative Affectivity. Further, task performance was related to teacher-assigned risk categories, such that individuals rated five years previously as "at risk" or "high risk" for the development of deviant behaviors were more likely to perform poorly on the tasks.

Additionally, individual difference variables were shown to play a significant role in self-report problem behaviors. Both self- and mother-report Effortful Control, as well as performance on the attention tasks, were related to problem behaviors. In addition, Effortful Control was negatively related to Aggression and Depression, as found both in Study 1 and in our original EATQ-R study (Ellis & Rothbart, 2002). However, parenting variables also contributed significantly to both Problem and Prosocial behavior scores, but not to Aggression and Depressive Mood scores.

We also found evidence of adequate internal reliability of the EATQ-R self- and parent-report measures, with the exception of the Inhibitory Control subscale. We found higher than expected agreement between parent- and self-report in early adolescence, but somewhat poorer convergence in later adolescence. However, we are not able to determine at this time if the poor convergence is primarily within a subgroup of participants. Overall, while the results of the studies were encouraging, they must be interpreted with caution, as outlined in the limitations discussed below.

Limitations, Future Directions, and Conclusions

The idea that individual differences in temperament play an important role in adolescent psychosocial development is not a new one, nor is there a paucity of research on the role of puberty in adolescent development. Further, there is ample empirical evidence to suggest that executive processes play a role in antisocial behaviors. The current set of studies attempted to examine contributions from a number of different sources of individuality, including temperament, executive processes, and puberty. In addition, temperament and executive processes were examined within the context of parenting and risk factors.

In general, the studies supported the original hypotheses. Individual differences, as assessed by self- and parent-report temperament measures, attentional marker tasks, and self- and parent-report pubertal status, all contributed in varying degrees to prediction of psychosocial development. Further, individual differences in temperament and attention were seen to contribute to psychosocial outcomes above and beyond parenting, risk, and family variables. Additionally, the studies supported the idea that the questionnaire and attentional measures developed in our laboratory are psychometrically sound and appropriate for use with a wide range of adolescents.

Other results that emerged from the current studies were rather unexpected, such as the decline in Effortful Control and Fear across puberty, and convergence of attention task scores and parent-report temperament scores in the absence of convergence with self-report scores. However, both studies suffered from limitations that require caution in interpretation of results. First, the large number of correlations conducted in the analyses

raise the possibility that some findings labeled as significant may be the result of Type I error. It has been suggested that multiple correlations be tested at a significance level equaling .05/C where C equals the number of correlations coefficients tested. For instance, if one is testing 50 coefficients, they should be tested at .05/50 = .001 level. However, given that relationships in the social sciences are often not particularly strong, such an adjustment then creates a high risk of a Type II error. As such, it is common for researchers to use .05 regardless of the number of coefficients tested; however, approximately 1 in 20 may be the result of error. It is important to note, however, that the strength of the relationship does not change regardless of any adjustments for stringency of significance levels.

An additional limitation has to do with the design of the studies. Study 1 was cross-sectional in nature and, while Effortful Control and Fear were seen to decrease across pubertal development, a longitudinal study would be necessary to allow measurement of possible decreases within individual subjects. Further, a decrease in Effortful Control would suggest a decrease in executive functioning; however, as attention was not assessed in Study 1, it is impossible to explore this possibility.

Second, the measurement of secondary sexual characteristics as a proxy for the internal mechanisms of pubertal development can allow us to say very little about hormone levels, brain development, or other internal physiological changes hypothesized to play a role in psychosocial development. While correlations between Tanner breast stage and estradiol levels are in the .60 to .80 range (Graber et al., 1996), there is no one-to-one correspondence between secondary sexual characteristics and hormone levels. In addition, the age range studied included too little variance in male pubertal development

to fully examine possible changes in emotional reactivity. Most males studied were either pre-pubertal or in the very early stages of pubertal development.

While participants in Study 2 are part of a long-term longitudinal study, measures of temperament and attention were not obtained in early adolescence; thus, it is not possible to examine scores for possible changes across time. Further, as participants in Study 2 are 16- and 17-years-of-age, it is safe to assume that most females are post-menarcheal, thus making the study of pubertal status, in the females at least, a moot point. Additionally, the poor convergence between self-report temperament and attention scores is troubling; nonetheless, self- and parent-report Effortful Control, as well as attention scores, were significant in explaining variance in problem behavior, suggesting that all three are measuring important aspects of self-regulation. However, problem behavior was measured via self-report, perhaps causing inflated relationships between other self-report variables and the outcome measure due to shared method variance.

Neither study assessed life events and, in particular, relationship events, in the study of Depressive Mood, yet stressful life events have been implicated in a number of different studies of adolescent depression (see Petersen et al., 1993, for a review). Thus, while individual difference variables do seem to play a significant role in depression, examining individual differences within the context of known environmental risk factors would provide a much richer framework of investigation.

Nonetheless, the current set of studies may serve as an important stepping-stone in a future line of work. Ideally, a group of adolescent participants would be followed through puberty and into late adolescence, with repeated measurement of attention, pubertal, and temperament variables in conjunction with environmental variables. This

design would allow examination of possible changes in temperament and attention scores, and would also allow examination of such changes within the context of environment. In addition, parents would be asked to provide periodic reports of their adolescents' temperament. This would allow exploration of the possibility that it is not temperament per se that changes during puberty, but rather the reporting tendencies of adolescents.

In conclusion, the current set of studies provides new information in two areas. First, pubertal maturation may be associated with a decrease in functioning of physiologically based regulation systems. This finding has important implications in the study of adolescent psychosocial development, as poor self-regulation has been implicated in a number of studies of adolescent deviance. Second, pubertal maturation may be related to increases in sensation seeking as well as in depressive mood. These findings suggest that such increases may be based, to some degree, in physiological changes rather than changes in social systems. Third, attention regulation, as measured by neural marker tasks, provides an important additional level of investigation of variables important in adolescent psychosocial outcomes. Indeed, such tasks allow us to make tentative links between brain function and real-world behaviors.

Human development involves social, cognitive, physiological, cultural, and environmental consistencies and inconsistencies. The variables that influence psychosocial development come from each of these domains, and interact with one another across the lifespan in intricate processes that differ from individual to individual. We may never fully understand the pathways that lead to positive outcomes in one child and negative outcomes in another. However, by utilizing an integrative approach to the

study of development, we may in the future come to have a better understanding of the complex organisms that are our children.

APPENDIX A

EATQ-R

Self-Report Items By Scale

Activation Control

I have a hard time finishing things on time. (R)

I do something fun for awhile before starting my homework, even when I'm not supposed to. (R)

If I have a hard assignment to do, I get started right away.

I finish my homework before the due date.

I put off working on projects until right before they're due. (R)

Affiliation

I want to be able to share my private thoughts with someone else.

I enjoy exchanging hugs with people I like.

I will do most anything to help someone I care about.

It is important to me to have close relationships with other people.

I am quite a warm and friendly person.

Aggression

If I'm mad at somebody, I tend to say things that I know will hurt their feelings.

When I am angry, I throw or break things.

If I get really mad at someone, I might hit them.

I tend to be rude to people I don't like.

When I'm really mad at a friend, I tend to explode at them.

I pick on people for no real reason.

Attention

It is easy for me to really concentrate on homework problems.

I find it hard to shift gears when I go from one class to another at school. (R)

When trying to study, I have difficulty tuning out background noise and concentrating. (R)

I am good at keeping track of several different things that are happening around me.

I pay close attention when someone tells me how to do something.

I tend to get in the middle of one thing, then go off and do something else. (R)

Depressive Mood

I feel pretty happy most of the day. (R)

My friends seem to enjoy themselves more than I do.

It often takes very little to make me feel like crying.

I get sad more than other people realize.

I get sad when a lot of things are going wrong.

I feel sad even when I should be enjoying myself, like at Christmas or on a trip.

Fear

I get frightened riding with a person who likes to speed.

I worry about my family when I'm not with them.

I worry about getting into trouble.

I am nervous of some of the kids at school who push people into lockers and throw your books around.

I worry about my parent(s) dying or leaving me.

I feel scared when I enter a darkened room at home.

Frustration

It bothers me when I try to make a phone call and the line is busy.

I get very upset if I want to do something and my parents won't let me.

I get irritated when I have to stop doing something that I am enjoying.

It really annoys me to wait in long lines.

I get very frustrated when I make a mistake in my school work.

It frustrates me if people interrupt me when I'm talking.

I get upset if I'm not able to do a task really well.

Inhibitory Control

It's hard for me not to open presents before I'm supposed to. (R)

When someone tells me to stop doing something, it is easy for me to stop.

The more I try to stop myself from doing something I shouldn't, the more likely I am to do it. (R)

It's easy for me to keep a secret.

I can stick with my plans and goals.

Pleasure Sensitivity

I like to feel a warm breeze blowing on my face.

I enjoy listening to the birds sing.

I like to look at the pattern of clouds in the sky.

I like to look at trees and walk amongst them.

I like the crunching sound of autumn leaves.

Perceptual Sensitivity

I notice even little changes taking place around me, like lights getting brighter in a room.

I tend to notice little changes that other people do not notice.

I am very aware of noises.

I can tell if another person is angry by their expression.

Shyness

I feel shy with kids of the opposite sex.

I feel shy about meeting new people.

I am shy.

I am not shy. (R)

High Intensity Pleasure

I think it would be exciting to move to a new city.

I wouldn't like living in a really big city, even if it was safe. (R)

Skiing fast down a steep slope sounds scary to me. (R)

I would not be afraid to try a risky sport, like deep-sea diving.

I wouldn't be afraid to try something like mountain climbing.

I enjoy going places where there are big crowds and lots of excitement.

Parent-Report Items by Scale

Activation Control

Has a hard time finishing things on time. (R)

If having a problem with someone, usually tries to deal with it right away.

Usually does something fun for awhile before starting her/his homework, even though s/he is not supposed to.

When asked to do something, does it right away, even if s/he doesn't want to.

Usually finishes her/his homework before it's due.

Usually gets started right away on difficult assignments.

Usually puts off working on a project until it is due. (R)

Affiliation

Likes taking care of other people.

Likes to be able to share his/her private thoughts with someone else.

Would like to be able to spend time with a good friend every day.

Enjoys exchanging hugs with people s/he likes.

Wants to have close relationships with other people.

Is quite a warm and friendly person.

Aggression

When angry at someone, says thing s/he knows will hurt that person's feelings.

If very angry, might hit someone.

Tends to be rude to people s/he doesn't like.

Slams doors when angry.

Doesn't criticize others. (R)

Tends to try to blame mistakes on someone else.

Makes fun of how other people look.

Attention

Finds it easy to really concentrate on a problem.

When interrupted or distracted, forgets what s/he was about to say. (R)

Has a difficult time tuning out background noise and concentrating when trying to study. (R)

Is good at keeping track of several different things that are happening around her/him.

Is often in the middle of doing one thing and then goes off to do something else without finishing it. (R)

Pays close attention when someone tells her/him how to do something.

Depressive Mood

Often does not seem to enjoy things as much as his/her friends.

Feels like crying over very little on some days.

Is sad more often than other people realize.

Is hardly ever sad, even when lots of things are going wrong. (R)

Sometimes seems sad even when s/he should be enjoying her/himself like at Christmas, or on a trip.

Fear

Worries about getting into trouble.

Worries about our family when s/he is not with us.

Is afraid of the idea of me dying or leaving her/him.

Doesn't enjoy playing softball or baseball because s/he is afraid of the ball.

Feels scared when entering a darkened room at night.

Is nervous being home alone.

Frustration

Is annoyed by little things other kids do.

Gets very irritated when someone criticizes her/him.

Gets irritated when I will not take her/him someplace s/he wants to go.

Gets irritated when s/he has to stop doing something s/he is enjoying.

Hates it when people don't agree with him/her.

Gets very frustrated when s/he makes a mistake in her/his school work.

Inhibitory Control

Has a hard time waiting his/her turn to speak when excited. (R)

Opens presents before s/he is supposed to. (R)

Is more likely to do something s/he shouldn't do the more s/he tries to stop her/himself. (R)

Is able to stop him/herself from laughing at inappropriate times.

Is usually able to stick with his/her plans and goals.

Shyness

Can generally think of something to say, even with strangers.

Is shy.

Is not shy. (R)

Likes meeting new people.

Feels shy about meeting new people.

High Intensity Pleasure

Thinks traveling to Africa or India would be exciting and fun.

Would be frightened by the thought of skiing fast down a steep slope. (R)

Thinks it would be exciting to move to a new city.

Wouldn't be afraid to try a risky sport like deep sea diving.

Expresses a desire to travel to exotic places when s/he hears about them.

Would like driving a racing car.

Likes it when something exciting and different happens at school.

Is energized by being in large crowds of people.

Wouldn't want to go on the frightening rides at the fair. (R)

APPENDIX B

BODY CHANGES QUESTIONNAIRES

APPENDIX C

STUDY 1 INSTRUCTION LETTER

APPENDIX D

INSTRUCTION SCREENS – ATTENTION NETWORKS TASK

Screen 1:
This is an activity about attention. You will see five arrows in the middle of the screen. Your job is to figure out which way the CENTER arrow is pointing. You choose your answer by pressing the correct mouse button on the keyboard.

For example, press the RIGHT button if the center arrow look like this:

-> -> -> -> ->

Screen 2:
Sometimes the center arrow will point in the opposite direction as the arrows around it. Remember, you need to show which way the CENTER arrow is pointing.

For example, the arrows might look like this:

-> -> <- -> ->

You should press the LEFT button because the CENTER arrow is pointing left.

Screen 3:
Before the arrows appear, there will be a plus sign ("+") in the center of the screen. The arrows will appear either above or below the ("+").

Keep your eyes on the ("+") throughout the activity.

Please press the SPACE bar to continue

Screen 4:
The Project Alliance assistant will show you where to place your hands. You will start this activity by practicing several times. Please try to work as quickly and accurately as possible.

Please press the SPACE bar to begin.

Post practice screen:
You have completed the practice activity.

Now the rest of the activity can be started. There are two more sessions in this activity. Each session takes about 5 minutes.

When you are ready, press the SPACE bar to start the first session.

Post session 1 screen:
You have finished session 1.

Please take a rest.

To start the next session, press the SPACE key.

Post session 2 screen:
You are done with this activity.

Please tell the PA staff member.

APPENDIX E

CHILD AND FAMILY CENTER QUESTIONNAIRE

Items by Scale

Prosocial Behaviors

- In the past 3 months, how often did you . . .

Complete assignments or homework on time
Participate in sports or organized activities (such as drama, music, religious groups)
Help with chores around the house
Cooperate with your parent(s)
Cooperate with your teachers
Attend church or religious activities
Act friendly and helpful to family members
Follow through with a plan or goal
Feel positive about going to school
Help someone not in the family
Volunteer in the community
Support a friend

Parental Monitoring

- In the past 3 months, how often did at least one of your parents . . .

Know what you were doing when you were away from home
Know where you were after school
Know about your plans for the coming day
Have a pretty good idea about your interests and activities
Compliment you for anything you did well
Give you something extra for doing something well

Parental Rule Making

- Fill in the blank with "Didn't have a rule or an expectation", "Sort of expected", "Definitely expected", "Had a clear rule"

My parent(s) _____ that I should do homework every day
My parent(s) _____ that I should not smoke cigarettes or use chewing (or smokeless) tobacco

My parent(s) _____ that I should not use alcohol
My parent(s) _____ that I should not use marijuana
My parent(s) _____ that I should not use drugs
My parent(s) _____ that I should not be with friends at our house or someone else's house without an adult around

Relationship Quality

-Over the last month:

I really enjoyed being with my parent(s)
I got along very well with my parent(s)
My parent(s) trusted my judgment
There was a feeling of togetherness in our family
Family members backed each other up
Things our family did were fun and interesting
Ate a meal with at least one of my parents
Talked with at least one of my parents about my activities

Parental Conflict

-How many times in the last week did the following things happen between you and at least one of your parents:

We got angry at each other
We argued during dinner
We had a big argument about a little thing
One of us got so mad we hit the other person
I got my way by getting angry

Prosocial Peer Affiliation

-In the last three months, did your friends:

Complete assignments or homework on time
Participate in sports or organized activities (such as drama, music, religious group)
Help with chores around their house
Cooperate with their parent(s)
Cooperate with their teachers
Attend church or religious activities
Act friendly and helpful to family members
Follow through with a plan or goal
Feel confident and proud of an accomplishment
Feel positive about going to school

Antisocial Peer Affiliation

-Over the last three months . . .

How many of our friends have cheated on school tests?
How many of your friends have ruined or damaged something on purpose that did not belong to them?

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