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Links between temperament and behavioral function

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LINKS BETWEEN TEMPERAMENT AND BEHAVIORAL FUNCTION

by

Theresa Anne Morgan

An Abstract

Of a thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Psychology (Clinical Psychology) in the Graduate College of The University of Iowa

December 2012

Thesis Supervisor: Professor Emeritus Lee Anna Clark

ABSTRACT

Despite a mutual interest in disordered behavior, the psychological approaches of individual differences and behaviorism historically have had little common research or discourse. Moreover, over time, both fields independently have developed methods of assessment and treatment that—despite being broadly applicable across populations—exist only in parallel. This also is despite the facts that (1) individual differences frequently are defined by specific types of behavior (or lack thereof), and (2) behavioral analyses may include "organism" variables that share features with temperament variables.

The primary goal of the current study is to examine relations between broad temperament factors and the function of problem behavior(s) identified through formal clinical assessment. The proposed model hypothesizes unique contributions of extraversion/surgency/positive affectivity (E/SPA) and neuroticism/negative affectivity (NNA) to the behavior functions of attention and escape, respectively. Subsidiary goals of the study included replicating previously identified temperament factors in this sample and assessing relations among temperament scales and behavioral form(s).

Fifty-three children and their caregivers were recruited from 4 behavior treatment clinics at the University of Iowa. Caregivers were asked to complete two measures of temperament/personality: the Children's Behavior Questionnaire Short Form (CBQ) and the Schedule for Nonadaptive and Adaptive Personality—Other Report Form (SNAP-ORF). Children also underwent behavior assessment procedures as part of their scheduled clinic appointment, and these records were

subsequently accessed to code function, form, frequency, and severity of problem behaviors.

Results showed significant, positive relations between E/S-PA and measures of attention function. These findings were consistent across several (though not all) measures of E/S/PA and attention function. In contrast, no significant relation between N-NA and either escape or attention was found. Structural modeling of temperament/personality was broadly consistent with the three factors proposed by the CBQ and SNAP-ORF. Several unique findings at the lower order trait level also were noted and are discussed.

The results from the current study provide an important first step in linking behavior and personality with regard to function in addition to behavioral form. Implications for the definitions of traits and function used in this project are discussed. Future research should expand on these preliminary findings to replicate and clarify relations among individual differences and behavioral functions.

Abstract Approved: _____

Thesis Supervisor

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Date

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Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

PH. D. THESIS

This is to certify that the Ph. D. thesis of

Theresa Anne Morgan

has been approved by the Examining Committee for the thesis requirement for the Doctor of Philosophy degree in Psychology (Clinical Psychology) at the December 2012 graduation.

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INTRODUCTION

Consideration of the interaction between the environment and the individual arguably has provided the basis for much of modern clinical psychology. Kurt Lewin (1935) referred to this interaction as a constellation of situation and individual that ultimately determined behavior; mathematically, (E_1, P_a) - B_A, or in general $B = f(P, E)$ [where E=environment, P=person, B=behavior]. That an individual behavior emerges from a combination of the individual and his or her environment has been stated repeatedly in psychological theory, and largely has been accepted. This view provides a model for human behavior that is parsimonious and yet unendingly complex. Even a seemingly simple behavior—for example, reading this paper—is subject to almost infinite possible influences, both external and internal. Have you been trained to read papers generally or specifically? If so, how has this behavior developed? Is there a mechanism of reinforcement currently at play? If so, what is it? Alternatively, is it that you simply are the type of person who enjoys reading or who feels responsible for reading student work?

Although determining the relevance of these seemingly endless possible variables may seem daunting, both the fields of individual differences and behavior have advanced considerably since Lewin's time. Domains of individual differences such as temperament and personality have been well established to have consistent structures in both abnormal and normal populations (see Markon, Krueger & Watson, 2005), suggesting a hierarchical trait structure that is stable across samples. Similarly, standard models of behavior assessment have been developed that systematically establish function and form of target behaviors (e.g., Iwata, Dorsey,

Slifer, Bauman, & Richman, 1982/1994). Despite being clearly detailed in their respective fields, however, there is a paucity of literature that jointly examines both personality and behavior assessment.

The present study proposes the concurrent assessment of individual differences and behavioral function and form, with the aim of detailing the links between these constructs more fully. To lay the groundwork for this proposal, one must first review these fields individually, with particular attention to places where concepts may overlap. First, dominant models of individual differences are discussed, with particular focus on temperament models and their use in child samples, and including discussion of temperament in special populations relevant to behavior analysis. Second, behavioral function is reviewed with respect to temperament. A section on clinical treatment is provided, with an emphasis on individual differences. Finally, conclusions drawing from both fields are offered and the current study is proposed.

Dominant Models of Individual Differences

Dominant models of individual differences typically refer to either personality or temperament as related constructs of individual differences. Although the current project will use temperament—rather than personality—dimensions, these constructs overlap considerably and in young children, may be considered conceptually identical (see Digman & Shmelyov 1996; Halverson et al. 2003; John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994; Mervielde & De Fruyt, 2002). Because current research uses both terms, I will first briefly define

and review literature from the fields of personality and temperament, and subsequently will provide a discussion of the terms relative to one another.

Personality

Allport (1927, pp. 289) defined personality traits as "…general and habitual mode[s] of adjustment which exerts a directive effect upon the specific response." Current definitions further hold that personality consists of constellations of related cognitive, motivational, behavioral, and emotional content (Allport, 1961; Bornstein, 2003). Taken together, research consistently underscores the import of personality for such life outcomes as (but not limited to): relationship quality, adaptation to life circumstances, psychopathology, functional impairment/ disability, occupational success, happiness, health, and even mortality (e.g., McAdams & Olson, 2010; Lodi-Smith & Roberts, 2007; Ozer & Benet-Martinez, 2006).

Currently, normal personality is modeled most commonly as five general traits. Known as the five-factor model (FFM; McCrae & Costa, 2008; 1987), or "Big Five" (e.g., Goldberg & Roselack, 1994), these factors are: Neuroticism (also referred to as Negative Temperament, Negative Emotionality, or Negative Affectivity), Extraversion (also referred to as Positive Temperament, Positive Emotionality, or Positive Affectivity), Agreeableness, Conscientiousness, and Openness (to Experience; called Culture in the Big Five or lexical tradition). The five factors have been shown to be robust across age, gender, and culture (McCrae & Costa, 2008; but see Block, 2001, for a dissenting viewpoint). Recent research even shows some support for FFM traits in non-human primates (Weiss, King &

Hopkins, 2007) as well as over 60 additional species ranging from fish to donkeys (Gosling, 2001), suggesting that the factors may be based in fundamental biological systems. Relatedly, FFM traits are reported to be moderately heritable, with overall heritability estimates between 42 and 57% (Jang, Livesley & Vernon, 1996).

The FFM has correspondences with models of personality that range into pathology such as Eyesenck's P-E-N (Psychoticism, Extraversion, Neuroticism; Eyesenck, 1990) and Cloninger's tridimensional personality (originally Novelty seeking, Harm Avoidance, and Reward Dependence; Cloninger, 1986; later amended to also include Persistence, Cooperativeness, Self-directedness, and Self-transcendence, Cloninger, 1994) models. Both normal and pathological trait models have been shown to converge onto five factors that can be identified as those of the FFM (see Markon, Krueger & Watson, 2005).

It is notable that the FFM functions well as a model for broader, higher order traits. However, a number of studies have confirmed that smaller, facet-level traits are more effective than FFM domain traits in predicting specific behaviors. For example, Paunonan and Aston (2001) assessed the FFM domain and facet scores in an undergraduate sample. Several specific behaviors were also queried, including (among others) smoking, alcohol use, traffic violations, speeding, purchasing lottery tickets, dieting, sex, blood donations, and medication use. Results showed that facet scales were as good or better than FFM domain scales at predicting these fairly specific behaviors. Notably, however, neither facet nor FFM scales were strong predictors of individual behaviors. These results suggest that although the FFM is a

useful general model, more specific traits may be needed to study behavioral outcomes in detail.

A growing literature supports the use of dimensional trait models for pathological personality (e.g., Ball, 2001; Clark, 2007; Clark, Livesley & Morey, 1997; Clark & Watson, 1999; Sheets & Craighead, 2007; Strack & Lorr, 1997; Westen, 1997; Widiger, 1993; Widiger, Simonsen, Sirovatka, & Regier, 2007; Wiggins & Pincus, 1989). The import of this literature has led to a proposal that personality in the *DSM-5* be diagnosed using a dimensional system (see APA, 2012; Clark, 2007). The proposed system incorporates dominant traits in personality and temperament research, such as those in the FFM and related models. As such, it is important to ensure that these variables are assessed in studies of individual differences, and particularly when assessing behaviors or outcomes relevant to psychopathology.

Temperament

A considerable quantity of research has been generated on the question of what constitutes temperament. Several points of consensus are clear: Temperament is (1) a set of dimensions of individual differences that are (2) relatively stable, both longitudinally and across situations (e.g., Janson & Mathiesen, 2008), (3) present from birth (e.g., Wachs, Pollitt, Cueto, & Jacoby, 2004) and thus (4) have a strong biological/genetic component (e.g., Ando et al., 2004; Krueger et al., 2002; Mervielde, De Clercq, Fruyt & Leeuwen, 2006). Some researchers also add the additional feature of association with clinical risk (e.g., for development of later psychiatric disorder or negative life outcomes; Caspi, Moffitt, Newman & Silva,

1996; Else-Quest, Hyde, Goldsmith & Van Hulle, 2006; Strelau, 1998; Tremblay, Pihl, Vitaro & Dobkin, 1994). Like personality, temperament can be considered both at the level of broad, over-arching dimensions (e.g., negative/ positive temperaments), or can delineate smaller, more detailed patterns of behaviors (e.g., activity level, cuddliness).

The majority of research in children (particularly in early childhood and infancy) uses temperament rather than personality to model individual differences. In contrast, studies using adult samples predominantly refer to personality traits, even when those traits comprise remarkably similar "temperament" variables (e.g., Clark, 1993). These tendencies suggest that temperament can be considered the earliest manifestation of individual differences in personality (Saucier & Simonds, 2006), although personality generally is conceived of as less biological and more environmental/ experiential in origin, and thus as encompassing a greater variety of behaviors and outcomes than does temperament (e.g., desires, perceived needs, preferences; Rothbart & Bates, 2006). Thus, temperament is considered what is present "innately," whereas personality is the result of the interaction of temperament with the environment (including prenatally). Nonetheless, this divide appears more conceptual than empirical, and little research has separated personality and temperament reliably (see Caspi, Roberts & Shiner, 2005; McCrae et al. 2000; Shiner & Caspi 2003; Shiner, 1998).

Structure of Temperament

Unlike personality, which most often is assessed via self-report questionnaires, temperament research has its basis in observable behaviors, which

are more easily measured in infants and children. Modern temperament models originated with the New York Longitudinal Study monographs (NYLS; Thomas & Chess, 1977; 1980). The authors worked from a background that emphasized both behavioral style—specific examples of behaviors consistent with individual differences that characterize an individual—as well as person-environment interaction. As such, temperament was considered subject to both internal and external pressures, "…influenced by environmental factors in its expression and even in its nature as development proceeds" (p. 9), suggesting that even temperament researchers recognized the necessary developmental shift from temperament to personality. The authors interviewed parents of 22 children, then drew temperament dimensions from the content using inductive analyses.

Thomas and Chess (1977) ultimately identified nine dimensions of temperament: activity level (motor activity), rhythmicity (regularity of behavior), approach-withdrawal (to novelty), adaptability, threshold of responsiveness, intensity of reaction, quality of mood (specific to positive mood), distractibility, attention span and persistence. Each dimension was defined and measured behaviorally, using variables such as responses to new stimuli, ability to attend given distraction, and visible affective responses. Although the initial nine dimensions ultimately were not well supported at the item level, the dimensions appeared more cohesive when considered as higher order factors (Presley & Martin, 1994). Factor analyses of these nine dimensions suggest five robust factors resembling the FFM (as described in McCrae & John, 1992; see also Martin,

Wisenbaker, & Huttman, 2007). However, these data have yet to be replicated, and Thomas and Chess' model is not commonly used in today's literature.

A second model of temperament was proffered by Buss and Plomin (1984, p. 5). These authors defined temperament as a "…constellation of inherited personality traits that appear early in life." The authors added that temperament can be distinguished from other variables of individual differences based on (1) biological inheritance and (2) presence in infancy and early childhood. The defining feature of the Buss-Plomin (1975; 1984) model lies in its emphasis on biology: Because temperament traits develop early, they are presumed to be more subject to biological effects than traits that develop later in life and appear more dependent on environmental outcomes (e.g., mistrust, entitlement). The authors detail four temperament dimensions (EASI): emotionality–tendency to experience a wide range of (predominantly negative) emotions; activity–level of energy and engagement; sociability–tendency to engage with others in pro-social behaviors; and impulsivity, tendency to engage in disinhibited and/or impulsive behaviors. These traits also bear some resemblance to dominant personality traits of Neuroticism/ Negative Affect, Extraversion/Positive Affect, Agreeableness, and low Conscientiousness, respectively.

A more recent temperament model is that proposed first by Rothbart and Dewberry (1981). This model has its basis in individual differences in reactivity to internal and external stimuli, and the mechanism by which organisms subsequently return to homeostasis (regulation; Rothbart & Posner, 1985). For example, the ability to become distracted when upset, or to break focus and move to new toys, are

both examples of regulating reactivity to environmental cues (Fox, 1998). Because it focuses on biological and observable responses to the environment, the Rothbart model is particularly behavioral, as are its associated measures. For example, items might refer to "looking at a caregiver" or "moving toward a new object." This differs from both the previous models, which also relied on internal factors such as "quality of mood" (Thomas and Chess) or "emotionality" (Buss & Plomin). However, several scales on measures using the Rothbart model nonetheless reflect external manifestations of presumed internal experiences such as fear, sadness, or pleasure.

Rothbart and colleagues have found consistent evidence for three broad factors of temperament across infancy and childhood (Ahadi & Rothbart, 1994; Capaldi & Rothbart, 1992; Sanson & Rothbart, 1995). The first factor, Extraversion/Surgency, is characterized by scales of approach, high intensity pleasure, and activity. The second, Negative Emotionality or Affectivity, is characterized by scales of tendencies to feel anger, fear, discomfort, and sadness. The final factor, Effortful Control or Persistence, is characterized by scales of inhibitory control, attentional focusing, low-intensity pleasure and perceptual sensitivity (see Tables 2 and 3 for details of scale scores). These factors appear to map well onto Extraversion, Neuroticism, and Conscientiousness from the FFM (Ahadi & Rothbart, 1994; Sanson & Rothbart, 1995; Galambos & Costigan, 2003), and also to the P-E-N model (Eyesenck, 1990).

Rothbart's temperament work improved on previous models in several ways. First, unlike Thomas & Chess (1977) or Buss and Plomin (1984), Rothbart argued

that temperament should be broad in scope, with conceptual overlap with personality (Goldsmith et al., 1987) and emotion (Putnam & Sifter, 2008). Further, in contrast to conventional views, she argued for simultaneous stability and instability of the construct, noting that although temperament/personality is relatively continuous into adulthood, it nonetheless would be expected to change and adapt somewhat over time. These two ideas revolutionized the field's view of the construct and study of temperament (see Putnam & Sifter, 2008).

Rothbart and colleagues also developed a set of measures to assess temperament across the life-span (Capaldi & Rothbart, 1992; Ellis & Rothbart, 2001; Gartstein & Rothbart, 2003; Putnam, Gartstein, & Rothbart, 2006; Putnam & Rothbart, 2006; Rothbart, Ahadi, Hershey & Fisher, 2001; Rothbart, Ahadi, & Evans, 2000; Simonds & Rothbart, 2004). Although not all scales appear for all age groups, many are consistent from infancy to adulthood, and almost all scales have extractable, higher order factors for Extraversion, Negative Emotionality, and Effortful Control (see Tables 3 and 4). In a recent review of the literature, these questionnaires were found to be the most frequently used temperament scales for infants and children (Klein & Linhares, 2007).

It is notable that Rothbart and colleagues consistently have endorsed a "components-of-variance approach" to their assessment. That is, laboratory, home, and questionnaire methods are viewed as imperfect, overlapping sources of information (Putnam & Sifter, 2008; Rothbart & Bates, 1998; 2006). Rothbart's model of temperament is thus, by design, particularly well-suited to concurrent behavioral assessment.

Temperament and the Five-Factor Model

At present, it generally is accepted that one speaks of "temperament" when referring to individual differences in children, and "personality" when referring to individual differences in adults. However, there is considerable overlap between these constructs and—as previously noted—it is currently unclear to what extent they tap similar or unique dimensions.

Although the bulk of recent research on the FFM has been conducted with adults, a preponderance of evidence suggests that the same five factors—Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A) and Conscientiousness (C)—are present in children and adolescents (e.g., Digman & Shmelyov 1996; Halverson et al. 2003; John et al. 1994; Mervielde & De Fruyt 2002). Recent studies have shown evidence of five factor traits even in children as young as 2 (Lamb, Chuang, Wessels, Broberg, & Hwang, 2002) to 3 or 4 (e.g., Abe, 2005; Halverson et al., 2003; Zupancic Podlesek, & Kavcic, 2006) years of age. These studies were conducted primarily using other (usually parental) report. However, children as young as 5 have been able to self-report five-factor traits (Measelle, John, Ablow, Cowan, & Cowan, 2005), and as young as 3.5 can self-report on specific lower order traits that resemble adult personality dimensions (Eder, 1990).

Moreover, structural analyses of factors and trait dimensions in models of temperament yield traits consistent with the FFM. Mervielde and Asendorpf (2000) reviewed temperament dimensions from three temperament models as described by Thomas and Chess, Buss and Plomin, Rothbart, and a review of the field (Caspi &

Shiner, 2006). These results showed a consistency in variables such as N, E, and C. For instance, Negative Emotionality (Thomas and Chess), Emotionality (Buss and Plomin), and Negative Affectivity (Rothbart) are all defined by tendencies to experiences and express negative emotions, as is common to Neuroticism (Caspi & Shiner, 2006). Similarly, Inhibition, (Thomas and Chess) versus? Sociability (Buss and Plomin), and Surgency (Rothbart) appear consistent with the expression of positive emotionality and a social orientation common to Extraversion (Caspi & Shiner, 2006). In addition, two models also included scales consistent with Conscientiousness (Task Persistence, Thomas and Chess; Effortful Control, Rothbart).

It is notable that neither Agreeableness nor Openness (to Experience/Culture) is clearly represented in temperament models. Mervielde and Asendorpf (2000) also suggest the addition of "Activity Level" as a trait important to childhood. Some variation of this trait appears in all temperament models, but is not well-represented in the adult-based, broad taxonomy of the FFM except as a component of the larger dimension of Extraversion. Similarly, Openness is almost completely absent from temperament models. In adults, Openness is the least consistent trait construct across FFM models, and frequently correlates highly with Extraversion despite being defined as an independent construct (r~.40; see Garcia, Aluja, Garcia & Cuevas, 2005).

Some authors have posited that Openness may be poorly represented in temperament due to differences in how the trait manifests in children. De Pauw, Mervielde & Van Leeuwen (2009) presented some evidence that Openness in

preschoolers is best assessed using concepts of Orienting Sensitivity (orientation to novel stimuli; see Evans & Rothbart, 2007) and Imagination. However, these results have not been assessed fully, and openness continues to be absent from measures such as Rothbart's.

Taken together, these results suggest that the dominant model of individual differences in adults also reflects important individual differences in children. Indeed, an updated version of the Merviele and Asendorpf (2000) taxonomy suggests five higher order dimensions combining temperament and personality models (Caspi & Shiner, 2006). Most important appear to be Extraversion/Positive Temperament and Neuroticism/Negative Temperament, both of which have several clear correlates in temperament models. To a lesser extent Conscientiousness also appears in both models.

Additional Concerns in Addressing Individual Differences in Children

Individual differences generally—and personality, in particular—have a long and varied history of study that emphasizes adult experiences. At pathological levels, personality typically is limited to adults: per the *DSM-IV*, personality diagnoses should be given to children or adolescents only rarely (American Psychiatric Association, 2004). Although the question of continuity is an important one, until comparatively recently, the adult-oriented perspective led to limited means for studying the presence of—or antecedents to—disordered personality before age 18. This belies what we know to be true: Anecdotally, we speak of happy and cranky babies, outgoing and shy toddlers, lazy and active children, and angry and anxious adolescents. Moreover, research consistently shows that

personality pathology does not develop spontaneously at age 18, and multiple researchers note links between childhood temperamental traits and pathological outcomes in adulthood (e.g., Widiger, Simonsen, Krueger & Verheul, 2005).

A recent meta-analysis by Roberts and DelVecchio (2001) provided strong evidence for the continuity of temperament/personality through the life-span. Although individual differences showed the most change in the years between infancy and toddlerhood (0-2.9 years, estimated cross-time correlation = .35), they were moderately stable throughout childhood and adolescence (3.0-17.9 years, estimated cross-time correlations = .45-.57) and increased in stability linearly through adulthood until at least age 50. Similarly, Caspi and colleagues reported significant associations between temperament at age 3 and personality at age 26 (Caspi et al., 1996). In a 19-year span, Asendorpf (et al. 2008) reported consistency on childhood temperament scales and adult personality and life outcomes related to inhibition.

Although suggestive that temperament is both stable and important to life outcomes, it is important to note that studies such as those described above rely heavily on other-report of temperament variables, including parent, teacher, or clinician reports. De Pauw and colleagues (2009) assessed the utility of self- as well as other-report data in child psychiatric outpatients. Their results suggested that links between temperament and outcome measures were most strong when reported by the same rater. Nevertheless, the majority of temperament research reports parent-assessed temperament.

Assessing Temperament in Special Populations

Developmental Disabilities: Clinical Presentation

Individual differences such as temperament and personality have been studied to varying degrees in special populations. Of particular interest to this paper are developmental disabilities, including such diagnoses as pervasive developmental disorder (PDD), down syndrome, angelman syndrome, and autism and autism spectrum disorders.

The developmentally disabled population is particularly likely to be diagnosed with comorbid behavior disorders or to seek treatment for problem behaviors, including self-harm or self-mutilation, stereotypic behavior, verbal or physical attacks on others (ranging from low to high impact, and including screaming, hitting, kicking, shoving, biting, etc.), noncompliance with requests, destruction of property and running away. In a sample of 432 long-term developmental care residents, Rojahn, Matson, Lott, Esbensen, and Smalls (2001) reported at least one such problem behavior in 73% of the population, notably higher than the nationally reported average of 41.4% (Anderson, Lakin, Prouty & Polister, 1999). Moreover, behavior problems are a significant barrier to integration in the community or admittance to residential care facilities (see Intagliata & Willer, 1981). As such, individuals with developmental disabilities are also the sample most likely to undergo formalized behavioral assessment procedures, such as functional analyses.

Assessing Individual Differences in Developmental Disabilities: General Considerations

The assessment of personality and individual differences in the presence of developmental disability provides a unique challenge (see Alexander & Cooray, 2003). For example, it is unclear at what time traits become stable in this sample as compared to normally developing individuals (Royal College of Psychiatrists, 2001). Communication problems may make it difficult to assess fully such internal states as thoughts, feelings, and motivations that define personality, a problem not addressed in current measures (Khan, Cowan, & Roy, 1997). Because the majority of personality and individual differences in children commonly relies on parental report and/or behavioral observations, this would seemingly present more of a problem in an adult as compared to a child sample.

In the case of disordered personality, diagnostic criteria also assume a level of cognitive ability that may be delayed in individuals with developmental disabilities. For example, Goldberg, Gitta and Puddephatt (1995) argue that paranoia—or 'preoccupation with unsubstantiated, conspiratorial explanations of events either immediate to the patient or in the world at large'—is extremely difficult to evaluate reliably in a developmentally delayed patient. Similarly, earlier studies may have confounded odd, socially unusual behaviors common to autism spectrum disorders with schizoid or schizotypal personalities (e.g., Deb & Hunter, 1991). Even when not delayed, other limitations on normal development may yield personality-like behaviors that do not necessarily indicate pathology. For example, an increased need for dependence on others in adults with developmental delays

make anxious/avoidant and dependent traits difficult to assess accurately in this population (see Reid & Ballinger, 1987).

The study of individual differences in this population is confounded further by a lack of established screening tools. The most common method of reporting personality traits in developmentally disabled individuals is clinical impression, or inferring traits based on known trait-diagnosis correlates when the individual has a previous diagnosis with personality pathology (Alexander & Cooray, 2003). Alternatives exist, such as the Structured Assessment of Personality (SAP; Mann et al., 1981), Reiss screen (Reiss, 1988), and Psychopathology Inventory for Mentally Retarded Adults (PIMRA; Matson, 1988), but these measures were designed primarily to assess personality pathology, and as such do not provide assessment of normal trait levels, nor are they suitable for a child sample.

It is somewhat unclear how models of normal personality that were developed for developmentally delayed populations relate to normal-range dominant models of personality, such as the FFM. One such measure is the EZ-Yale Personality Questionnaire (EZPQ; Zigler, Bennett-Gates, & Hodapp, 1999), which includes scales for: effectiveness motivation (EM; preference for challenging/novel tasks); obedience (Ob; following specific directions); negative-reaction tendency (NRT; wariness of strangers); positive-reaction tendency (PRT; interaction with and dependence on others); creativity/curiosity (CC; interest in novel stimuli); expectancy of success (ES; at tasks); and outer-directedness (OD; tendency to look to others for help). These scales have yet to be investigated beyond initial scale development, and no clinical data exist for their use in informing treatment.

Further, although some scales have superficial resemblance to common temperament constructs—for example, CC appears consistent with openness to experience, and PRT and NRT may reflect positive affect/extraversion and negative affect/neuroticism, respectively—these other scales do not yet have empirically demonstrated relations to traits in dominant models. This is a surprising gap, given the vast body of research demonstrating consistency between pathological and normal samples in general (e.g., Markon, Krueger & Watson, 2005).

Assessing Temperament in Developmental Disabilities:

Specific Diagnoses

Nonetheless, temperament characteristics associated with specific developmental disabilities are well known to clinicians and researchers. In many cases, temperament is even included in the diagnostic criteria of such disorders. For example, both down syndrome (Fidler, 2006) and angelman syndrome (Williams et al., 2006) are associated with an overall "happy disposition": The former differentiated by a strong tendency towards sociability/surgency (see Nygaard, Smith & Torgensen, 2002) and the latter with frequent, excessive laughter. In contrast, autism spectrum disorders (e.g., PDD, autism, and Asperger's disorder) all are defined by a paucity of or marked lack of interest in normal social interaction (APA, 2004). Such descriptions overlap considerably with that of extraversion and its facets, although at least one study failed to find a difference between children with autism and normal controls on this construct (Konstantareas & Stewart, 2006). In contrast, the criteria of Rett Syndrome—which is associated with panic attacks

and inconsolable crying—appear to reflect facets of negative affect or neuroticism (APA, 2004).

Assessing Behaviors in Developmental Disabilities:

Specific Diagnoses

As with personality, descriptions of disorders and their associated temperament characteristics only vaguely suggest functional properties of behaviors. Clinical judgment dictates that one is more likely to find problems related to attention-seeking (in behavior analytic terms, an "attention function") associated with problem behavior for a client with down syndrome as compared to one with autism. However, functional characteristics of behavior have yet to be examined fully in these groups. Instead, the vast majority of published research uses a single-case design, with small ($N < 10$) samples insufficient to detect the effects of individual differences at a group level. Further, such studies tend either to have a diverse sample selected for a non-disorder characteristic, so specific disorders may be represented by only one individual in the sample, or they are disorder-specific and thus may not generalize across multiple diagnoses. As such, it remains unclear (1) to what extent these populations can be differentiated from each other by individual differences in temperament, (2) whether established models of temperament adequately capture individual differences in people with developmental delays, or (3) how these differences relate to the development of problem behaviors.

Behavior Disorders: Clinical Presentation

Also diagnosed predominantly in children are behavior disorders, including disruptive behavior disorder (DBD), oppositional defiant disorder (ODD), and conduct disorder (CD; *DSM-IV*, APA, 2004). These disorders are characterized by disregard for social norms, rules, and/or authority figures, and are associated with severe decrements in the quality of daily functioning (Keenan & Wakschlag, 2000; Stallard, 1993). An estimated 4% of community or primary-care samples of children meet diagnostic criteria for CD, and 4-8% for ODD (Egger & Angold, 2006). If untreated, approximately half of children with ODD will continue to meet criteria for ODD at 3-year follow-up; similarly, approximately half of these will meet criteria subsequently for CD (Lahey, Loeber, Wuay, Frick, & Grimm, 1992). Research on these disorders typically collapses ODD and CD into a single construct referred to generally as behavior disorders (e.g., Burke, 2009).

Assessing Individual Differences in Behavior Disorders: Internalizing and Externalizing

Childhood disorders often are conceptualized as either "internalizing" or "externalizing," with behavior disorders falling solidly on the externalizing spectrum. Internalizing refers to internally oriented distress, such as anxiety or inhibition, whereas externalizing refers to distress that is externally directed, such as aggression or destruction of property. However, it must be noted that these two dimensions typically correlate around .50 (I can dig up a reference if you don't know of one).

In theory, individual-differences variables and environmental contingencies interact to produce internally and/or externally oriented behavior problems (Elliot & Thrash, 2002). For example, high levels of surgency (i.e., high activation and/or low inhibition) may lead to externalizing problems if goals are blocked (e.g., Derryberry & Reed, 1994; Rothbart & Putnam, 2002). In contrast, low levels of surgency may lead to internalizing problems independent of environmental contingencies (e.g., Fowles, 1993; Windle, 1994).

In psychiatric samples, high correlations are found routinely for internalizing problems with emotional instability, shyness, introversion, and self-regard/self-esteem, and for externalizing behaviors with (dis-)agreeableness/antagonism, low effortful control, and impulsivity (e.g., De Pauw et al., 2009; Hagekull, 1994). As with many psychiatric disorders, negative affectivity/temperament (or neuroticism) appears to be a general risk factor for later development of both externalizing and internalizing problems for children as young as 4 (Hagekull, 1994). These patterns are similar—but with slightly smaller effect sizes—when self-report is used in place of parent-report (Oldehinkel, Hartman, De Winter, Veenstra, & Ormel, 2004).

Assessing Individual Differences in Behavior Disorders:

Specific Diagnoses

Although internalizing and externalizing provide broad, general constructs of individual differences in behavior, they are not commonly used in behavior research, in part because they fail to discriminate among behavior disorders. For example, factor analysis of ODD symptoms suggests a two-factor solution consisting of (1) touchiness, anger that is not expressed behaviorally (e.g., through

fights), and vindictiveness (e.g., holding grudges)—associated with later depression, but not with CD symptoms—and (2) argumentativeness and temper (e.g., quick behavioral reactions to anger)—which predicted later CD symptoms, but not depression (Burke, 2009). As such, ODD is associated with dimensions of oppositional behavior (externalizing) and negative affect (internalizing; see Loeber, Burke, & Pardini, 2009). Further, diagnosis with ODD alone failed to discriminate later development of CD in this sample. In a recent review of the field, specifically including ODD and CD, Loeber and colleagues (2009) state, "…the evidence regarding temperament and later disruptive psychopathology is suggestive of general links, but has not identified specific aspects of temperament as predictive of distinct disruptive psychopathology" (p. 295).

Individual Differences and Behavior

As is evident from the above review, personality and temperament research has converged on a consistent structure and definition that emphasizes trait dimensions that are continuous over time, and that link in meaningful ways to observable life events. Although there is general agreement that personality can be measured by observable behaviors, there is also generally reference to internal variables that are hypothesized to cause or affect behavior prior to its being observed (e.g., Hayes, Follette & Follette, 1995). Thus, personality can be considered to be comprised of behaviors as well as a set of consistently occurring, internal, intrapsychic events (Shonda, Mischel, & Wright, 1994). However, the extent to which the behaviors cause, result from, or co-occur with internal experiences is both an empirical question and a matter of both longstanding

conceptual debate in the field (see Funder, 2001; Kenrick & Funder, 1988; Mischel, 1968).

Interestingly, Skinner (1953) argued that personality can be subsumed by behavior theory almost entirely, defining personality as "topographical subdivisions of behavior" tied to a particular setting event or discriminative stimulus (p. 149); later he defined personality overall as "at best a repertoire of behavior imparted by an organized set of contingencies (p.285). This belief was echoed by later behavioral and personality theorists, who detailed ways in which behavior may or may not be reinforced to produce patterns of intrapsychic experiences such as guilt or fear (e.g., Bijou & Baer, 1966; Dollard & Miller, 1950; Eyesenck, 1959; Harzem, 1984; Pronko, 1980; Staats, 1993). By extension, these researchers describe personality as akin to shorthand for clinicians to refer to sets of behaviors or behavioral histories that commonly co-occur. For example, a patient who does not seek out social interactions at a high rate may be hypothesized to have some behavioral history of being reinforced for social avoidance or punished for social engagement. In personality terms, we may refer to such a person as low in extraversion. Although the verbal description may differ from behavior analysts to personality theorists, the fact nonetheless remains that personality labels can be both behaviorally meaningful and useful for clinicians and patients alike (see Harrington, Fink & Dougher, 2001).

Functional Models of Behavior

Functional models of behavior are—as the name suggests—focused on the function of a given behavior. Thus, the *'why'* of behavior becomes as important as

the *'what.'* In these models, behaviors are viewed as 'ongoing acts in context' (Hayes, 2004), and are organized by the functional properties by which they are maintained (Hayes, Wilson, Strosahl, Gifford & Follette, 1996). As such, models of personality disorders (PDs) that attend only to overt behaviors may be inadequate without additional attention to the underlying reason(s) for the behaviors.

Goldfried and Sprafkin (1976) presented a model of behavior based on stimulus-organism interactions known as the SORC (*S*timulus, *O*rganism, *R*esponses, *C*onsequences). In the SORC model, the S refers to discriminative stimuli (Sd) that are associated with the target behavior in some way. The O refers to organism variables characteristic of the individual. R is the response of interest—in the case of PDs, problematic behaviors associated with the disorder. C represents consequences of the response, which may be distal, proximal, or both. Although an older model, the SORC model is still commonly used in current behavior research.

Individual differences in the form of temperament have not yet been studied in the SORC model. However, temperament could be incorporated into the SORC model in a variety of ways. Of most interest to temperament researchers is the issue of *O*rganism variables. A small number of studies have examined the effect of pre-existing biological variables such as infections (Carr, Newsom & Binkoff, 1980; Gunsett, Mulick, Fernald & Martin, 1989), allergies (Gardner, 1985), caffeine use (Podboy & Mallory, 1977), exercise (McGimsey & Favell, 1988), and menstrual pain (Taylor, Rush, Hetrick & Sandman, 1993). Such studies are relevant to

personality research because they provide preliminary evidence for the import of pre-existing individual differences—state or trait—to behavioral response.

As compared to the form of behavior, very little research has been conducted linking behavioral function to variables of individual difference. One reason for this may be that the current diagnostic system preferences form over function (Nelsen-Gray & Farmer, 1999). That is, many diagnoses in the current *DSM* specify only a behavior per se without a reference to its purpose. This is clearly true for disorders involving individual differences such PDs.

At best, function is described inconsistently in the *DSM* PD diagnoses, and only rarely, if at all, appears in the criteria other than as a broadly-defined motivation for behavior (APA, 2004). As a result, understanding the DSM-IV PDs 'functionally' can be difficult. For example, one criterion for antisocial PD is: "repeated physical fights or assaults" (*APA*, 2004, p. 706). Here, the form—physical conflicts—is clear, but the function of the behavior is not. In contrast, histrionic PD specifically references "attention-seeking" behaviors such as exaggerated speech, inappropriate sexuality, or exaggerated displays of emotion. What remains unclear is whether the behavior is actually maintained by the function (that is, to what extent is the 'exaggerated speech' under environmental control of reinforcement with attention vs. other reinforcers?). Moreover, both histrionic and dependent PDs are characterized by sensitivity to social reinforcement, but in histrionic PD both positive and negative social reinforcement are important, whereas in dependent PD positive social reinforcement is theoretically most relevant to maintaining behavior. Rasmussen (2005) suggests avoidant PD is associated with

a primary motivation for and fear of interpersonal relationships. The resultant behaviors are thus maladaptive because they consist of approach and avoidance responses that persist despite failing to achieve the desired outcome. Similarly, it can be argued that avoidant PD reflects a function of escape (from feedback, anxiety), but these kinds of functions have yet to be tested experimentally. Of course, current definitions of PDs were not specifically designed with respect to function, which contributes to the confusion. To date, no study has assessed functional properties of the full range of DSM-IV personality disorders.

Clinical Models and Functional Contextualism

It is notable that current treatment models are coming back around to incorporate the function of behavior into clinical interventions (e.g., Farmer & Nelson-Gray, 2005; Hayes, 2004; Hayes & Strosahl, 2004; Morris, 1988). These models build on Skinnerian behaviorism and reflect a philosophy known as functional contextualism, which emphasizes the manipulation of variables in context with both external (environmental) and internal (individual) contingencies (Hayes, 2004). Indeed, many currently recommended treatment models including cognitive-behavioral, acceptance and commitment, and functional analytic (psycho-)therapies (CBT, ACT, and FAP, respectively) are designed with consideration of both internal, individual characteristics and systematic manipulation of external, environmental contingencies. Furthermore, the issue of functional analysis in PDs has become of interest to theorists and clinicians, as evidenced by the slow increase in articles on the topic (e.g., Bornstein, 2003; Didden, 2007; Folette, 1997; Funder,

2008; Hayes & Folette, 1992; Mochizuki & Sato, 2002; Nelsen-Gray & Farmer, 1999; Nelson-Gray, Mitchell, Kimbrel, & Hurst, 2007; Staats, 1998).

With the trend towards incorporating internal and external contingencies into clinical practice, it is unfortunate that so little research has been conducted assessing the interaction of function with internal differences such as temperament. Indeed, with the exception of the use of Dialectical Behavior Therapy (DBT; Linehan, 1993a; 1993b) to treat borderline PD, few published studies have documented the use of behavior analytic models for personality pathology. Moreover, a recent review of current behavioral therapies yielded 13 randomized controlled trials (RCTs) for the use of DBT (Ost, 2007), but of these 13 studies, only 1 (Linehan et al., 2006) met the reviewer's criteria for a well-designed RCT. The remaining 12 studies had unclear alternative protocols (e.g., treatment as usual or TAU), had prescription drugs as a confounding variable, or produced inconclusive results.

It is apparent that both personality and behavior techniques have emerged as guiding principles in modern clinical psychology. As such, it is regrettable that so little of the clinical literature addresses issues common to both. Part of the reason for this discrepancy may be the emphasis on longer term outcomes in temperament assessment and personality research, as compared to the more proximal concerns that are typical in behavior analysis. With few exceptions, no study has established clearly the degree to which temperament can be used to prescribe particular treatment models (see Hayes, Nelson & Jarrett, 1987; but see Lynch & Cheavers for a dissenting example). In contrast, it is widely established

within applied behavior analysis that—by establishing what conditions account for a particular problem behavior—one also can identify what conditions need to be altered to produce a desired change in behavior (see Cooper, Heron & Heward, 1987).

Assessing Function

In its simplest form, functional behavior assessment is a process for establishing empirically why behaviors occur (Brown-Chidsey, 2005). It serves as both a theoretical framework for understanding behavior and a set of assessment procedures. Results using these procedures suggest that (1) behavior assessments must be conducted on an individual basis, (2) topographies of behavior may be maintained by multiple forms of reinforcement, and (3) interventions are most effective when they are based on the function(s) of behavior rather than on other variables such as the form of the behavior (e.g., Brown-Chidsey, 2005; Shapiro & Kratochwill, 1988, 2000; Watson & Steege, 2003).

A functional analysis (FA) is perhaps the most common form of functional behavior assessment. First developed by Iwata and colleagues (1982/1994), a functional analytic procedure is an analog procedure in that it attempts to replicate naturally occurring reinforcement conditions in the clinic. Data are typically collected at close intervals (e.g., every 6 seconds) during behavior analysis procedures such as functional analyses. From a functional perspective, behavior is understood only in relation to its controlling contingencies, and in the context in which it occurs.

Typically, three classes of reinforcement are observed in a functional analysis: attention, escape (from tasks or demands), and access to tangible rewards (preferred objects) (Didden, 2007). In each condition, the target behavior is reinforced by access to the associated outcome. For example, a child may be given attention by a caregiver (attention), be permitted to leave homework unfinished (escape), or be given his or her favorite toy (tangible) when the target problem behavior occurs. Incidence of behavior is then compared to a baseline condition, usually free play wherein all reinforcement classes are available. A systematic relation observed between a problem behavior and a condition indicates a functional relationship between those variables. Behavior is then referred to as having, for example, "an attention function." Treatment is prescribed based on function, and may include changing reinforcement contingencies (e.g., to noncontingent reinforcement, or to reinforcement of preferred behaviors), changing antecedent conditions (e.g., to remove Sds that serve as "triggers"), or even implementing basic routine changes such as daily schedules or time outs.

Function, Behavioral Analysis, and Individual Differences

By definition, behavior assessments consist of manipulation of variables establishing environmental control over behavior. Although such assessments are highly individualized to patients and environments, they typically give little formal attention to issues of internal individual differences (Williams, Myerson & Hale, 2008). This may be because in the absence of data as to how a particular behavior was acquired, behavior analysts traditionally defer to current, observable contingencies in place of non-observable, latent variables such as personality

(Thompson & Williams, 1985; Skinner, 1974). In the absence of such speculation, it is easy to conclude that behavior analysts are disinterested or even actively eschew individual differences, which is a commonly voiced criticism of behaviorism (Maddi, 1996; Phelps, 2000; Williams, Myerson, & Hale). Indeed, the general perception of behaviorists seems to be one of extreme or radical environmentalism, essentially "they don't like traits and they don't like genes" (Meehl, 1986, p. 315). Despite this perception, variables of individual difference are increasingly common in published behavior research. Known as "organism variables," these constructs detail ways in which individual differences between organisms interact with external contingencies (Nelson & Hayes, 1981). Such articles cover a wide range of individual differences, including consumer choices (Oliveira-Castro, Foxall & Schrezenmaier, 2006), reading skills (Daneman & Carpenter, 1980), self-control (Darcheville, Riviere & Wearden, 1992), working memory (Daneman & Carpenter, 1980), processing speed (Chen, Hale & Myerson, 2007; Myerson, Hale, Hansen, Hirschman, & Christensen, 1989), intelligence (Williams, Myerson, & Hale, 2008), positive engagement or interest in the environment (Lancioni, O'Reilly, Campodonico, & Mantini 2002; Realon, Bligen, La Force, Helsel, & Goldman, 2002), risk-taking (Riber, Contreras, Martinez, Doval & Viladrich, 2005), and mood states such as happiness (Broome, 2007; Green & Reid, 1996; Green, Gardner & Reid, 1997; Lancioni et al., 2004; Moore, Delaney & Dixon, 2007) or unhappiness (and fatigue, Kelly, Hienz, Zarcone, Wurster & Brady, 2007; Silverman & Griffith, 1992). Given the wide range of individual differences that are studied, it is surprising that temperament has been overlooked.

Although there is an overall paucity of research detailing links between behavior analytic accounts and personality, a few such examples can be found. Interestingly, the majority of such examples are on aggressive behavior, perhaps due to its high base rate in childhood. For example, Shonda and colleagues (1994) present data from children's aggressive behavior in 5 types of situations: peer approach, peer tease, adult praise, adult warn, and adult punish. The authors report profile stability at retest ranging from r=.11 to .96, noting that the children differed widely in profile stability and rate of behavior which they defined as 'personality coherence visible in the intra-individual pattern of variability.' Importantly, the authors discuss the results in terms of variance/stability of behavior over multiple situations, rather than directly testing behavioral function. Moreover, no outside (e.g., nonbehavioral, other-report) measures of personality were administered.

In a meta-analysis of personality and aggressive behavior under provoking and neutral conditions, Bettencourt and colleagues (2006) summarized 63 studies that assess the interaction between personality and the environmental antecedent 'level of provocation.' Results from their analyses showed (1) that individuals high in trait aggression/ irritability behaved more aggressively under all conditions (neutral and provoking); whereas (2) that trait anger, 'type A personality,' dissipation-rumination, emotional susceptibility, narcissism, and impulsivity were associated with greater aggressive behavior only when the individual was first provoked. Thus, consistent with Shonda et al (1994), personality traits were seen as moderators of behavior response under certain conditions. However, again only rate of behavior under specific conditions was assessed, rather than establishing a

particular function for aggression. As such, we know individuals higher in aggression are more likely to aggress across all conditions, but it remains unclear what reinforcer maintains that behavior, or whether that reinforcer differs for individuals high in traits such as narcissism or impulsivity. Similar studies also have examined conditions known to moderate aggressive behaviors through situational cues (e.g., violence; Carlson, Marcus-Newhall & Miller, 1990; Paik & Comstock, 1994).

From a more behavioral perspective, Tustin, (2000) examined individual differences as preference for reinforcers, nothing that individual differences in reinforcer preference may be related also to consistent differences in behavior as also is evidenced in personality. However, no empirical research exists formally linking reinforcer preference to personality traits. Such a link certainly would seem clear for traits such as extraversion (preference for social reinforcement), neuroticism (preference for escape/avoidance), or conscientiousness (preference for structure). Links between personality and reinforcer preference may have particular utility for treatment (also see Harrington, Fink & Dougher, 2001). Similarly, Ribes and colleagues (2004) present data demonstrating within-subject consistencies in risk-taking across different reinforcement contingencies, reflecting "individual styles" in real-time interactions. In this set of studies, the reinforcer for the behavior was manipulated only in quantity and likelihood of delivery, thus assessing preference for more subtle differences in reinforcer qualities than did Tustin (2000). Again, though the authors exhaustively discuss personality and its relation to

behavior, no formal personality assessment procedure was administered to any of the participants.

Importantly, assessing personality via intense scrutiny of individual behaviors is fairly consistent with an idiographic focus on personality, which largely fell out of favor in personality psychology due to "an absence of appropriate methods and theory for studying individual functioning in ways that are objective and scientific rather than intuitive and clinical" (Shonda, Mischel, & Wright, 1994).

Interestingly, conceptualization of personality pathology increasingly incorporates both reasons for behavior in addition to behavioral topography. For example, Turvey (2008) suggests that sadism and psychopathy (and, by extension antisocial personality traits) can be separated by motivation: the former is motivated by internal pleasure of harming others, the latter is motivated primarily by external reinforcement such as monetary rewards (aided by a lack of empathy). Similarly, Horowitz and Wilson (2005) suggest a new conceptualization of personality disorder (PD) based almost entirely on frustrated motives and their outcomes. Through association with decreased negative affect, such behaviors persist despite a lack of external reinforcement, overall non-reinforcement, or even punishment. Although promising, the role of full functional information—antecedent 'motivations,' behaviors, and outcomes—has yet to be explored fully in the literature, so it remains unclear whether personality traits comprise, or should be used additively with, functions of behavior to predict treatment outcomes.

Conclusions and the Current Study

As mentioned, at present, no existing literature draws equally from both behavior analytic and temperament literature. Again, this is a particularly surprising gap, given the clinical relevance of both resources—one addressing the internal experience, and the other the external experience, of an organism—and the increasing trend from both fields towards inclusion of the full context for understanding behavior. Thus, research addressing the interplay of temperament and behavioral function is sorely needed.

The applied analytic approach, despite the inclusion of organism variables in the SORC model, traditionally has eschewed consideration of internal, individual differences in favor of manipulating external variables (Critchfeld, 2002). Although incorporation of behaviorism in personality and temperament studies is comparatively less exclusive, in most cases this research offers only preliminary data into functional models for personality. In contrast, personality is defined not only by internal states such as thoughts, feelings, and motivations, but also by externally observable behaviors (Bornstein, 2003). However, although functional properties may be implied, to date it appears that no studies have assessed both the function and form of behaviors as they relate to personality variables.

The current study proposes an examination of relations between individual differences and behavior with respect to function. Results will benefit researchers in temperament and personality by increased understanding of the functional content and utility of traits; conversely, behavior models will benefit from a more clearly outlined role for individual differences as an organism variable. It is hoped that this

will provide an important first step towards meaningfully integrating temperament models into behavioral assessment, and ultimately into the treatment of disorders characterized primarily by behavioral problems.

Due to the dearth of previous research, it is reasonable to use the most parsimonious and dominant models from both fields. Because the majority of basic functional analyses are conducted with a child sample, I propose to study this population. Individual differences will be assessed using temperament models that tap both specific dimensions (facets) of individual differences (e.g., scale-level differences), as well as broad, overarching trait domains consistent with personality theory (e.g., Neuroticism/Negative Affect, Extraversion/ Positive Affect).

The primary goals of the current study are threefold:

1. To establish the psychometric validity and reliability of Rothbart's temperament model in a child-clinical sample selected for behavior dysfunction, and to replicate a three-factor structure consisting of the FFM (minus agreeableness and openness to experience) in this sample (see Figure 1);
2. To examine correlations among behavioral functions;
3. To examine relations between function and temperament, with particular attention to: (a) Negative Affectivity with escape function(s), and (b) Positive Affectivity with attention function(s) (see Figure 1).

Two additional, subsidiary goals are:

4. To provide descriptive information about temperament for diagnoses where such data are not established, and to compare diagnostic groups on dominant traits when sufficient sample size for comparisons is available; and
5. To replicate previous findings linking behavior form to temperament variables, specifically as this pertains to the general contribution of negative affectivity to both internalizing and externalizing behaviors.

METHOD

Participants

Participants were 53 children aged 2-10, with a mean age of 5.42 (SD=2.47). They were 64.2% male (*n* = 34) and 35.8% female (*n* = 19), and were accompanied by an average of 2 family members to their clinic appointments (SD=.92; range=1-4), most commonly the child's mother (*n* =49; 92.5%), father (*n* =27; 50.9%), other family such as siblings or grandparents (*n* =17; 32.1%), or non-family member, such as school employees or childcare professionals (*n* =7; 13.2%). All participants spoke English as a first language, with one child further identified as bilingual in Spanish. Permission to participate and temperament data were provided by parents and/or legal caregivers of the child. Because all children were accompanied by at least one parent (biological or otherwise), the term "parent" will be used hereafter to broadly designate any parent (e.g., biological, foster) or other adult caregiver (e.g., other relative) providing data on the child participant.

Psychiatric and medical diagnostic data for the participants are shown in Table 1. The mean number of psychiatric diagnoses was 1.26 (SD=1.53; range= 0-7), and the mean number of medical diagnoses was .79 (SD=1.73; range= 0-9). The most common psychiatric diagnosis was Disruptive Behavior Disorder (DBD), which was diagnosed in the clinic record from that day for 50 of the 53 patients. Also commonly diagnosed were language disorders (32.5%), Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS; 18.9%), and Attention Deficit/Hyperactivity Disorder (ADHD; 18.9%). Medical diagnoses

varied widely, but most commonly included hearing or vision impairments (15.1%) or genetic conditions such as Down Syndrome (13.2%).

Per the DSM-IV, psychosocial and environmental problems were typically noted on Axis IV of patient records. Importantly, the hospital does not require V-codes for Axis IV, and as such entries were described and noted at the discretion of the clinician. The average number of Axis IV entries was .52 (SD=.98; range= 0-4) with 41 (of 49) unique entries. Axis V was coded only in three cases, all of which had a global assessment of functioning (GAF) rating of 60. Due to the scarcity of data, Axis IV and V results were not analyzed.

All participants were recruited from 4 behavioral assessment and treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics: (1) the BioBehavioral Outpatient service, which serves individuals with a disability from infancy to adulthood; (2) the Behavioral Pediatrics Clinic, which serves typically developing children from approximately age 2-10; (3) the Autism Clinic, which sees children both for behavior plans as well as diagnosis/assessment for autism spectrum disorders; and (4) the BioBehavioral Day Treatment Service, which serves any individual seeking more intensive daily interventions (frequently referred from the day clinics, when a single, outpatient clinic appointment is determined to be insufficient).

These clinics take patient referrals for a wide range of childhood behavior problems, including those typically considered externalizing (e.g., hitting, kicking, tantrum) as well as those considered to have internal origins (e.g., self-injury, stereotypy). Historically, the most common diagnoses for patients attending these

clinics are developmental disabilities (e.g., pervasive developmental disorder) and/or childhood behavior disorders (e.g., disruptive behavior disorder). Clinic appointments vary from 1 hour to several days, including assessment and treatment.

Participants were recruited based on age (2-10 at the time of recruitment). To ensure heterogeneous sampling, no other exclusion criteria were applied. The majority of participants (*n* =45; 84.9 %) were enrolled during their first visit to the recruiting clinics. However, 6 participants (11.3%) had 1, and 2 participants (3.7%) had 2, previous behavioral assessments available in hospital records. In all cases, data were gathered only from the appointment at which recruitment took place.

Measures: Individual Differences

Parents were asked to complete two measures of individual differences for each child participant: the Children's Behavior Questionnaire Short Form (CBQ; Putnam & Rothbart, 2006) and the Schedule for Nonadaptive and Adaptive Personality—Other Report Form (SNAP-ORF; Harlan & Clark, 1999). Importantly, the CBQ is a measure of childhood temperament in the normal range, whereas the SNAP-ORF was originally designed as an adult measure of pathological personality traits (with traits nonetheless measureable in childhood—see Linde, Stringer, Simms & Clark, 2012). As previously noted, considerable overlap has been found between normal-range and pathological personality, particularly with respect to higher-order constructs such as extraversion/positive affectivity, neuroticism/negative affectivity, and to a lesser extent, conscientiousness/disinhibition vs. constraint (see Markon, Krueger & Watson, 2005). Both the CBQ and the SNAP-ORF include scales designed to assess these higher-order constructs, with rough correspondence

between: CBQ Surgency and SNAP-ORF Positive Temperament; CBQ Negative Affectivity and SNAP-ORF Negative Temperament; and CBQ Effortful Control and SNAP-ORF Disinhibition. To avoid confusion, subsequent analyses will refer to the specific scale (e.g., "CBQ Surgency") when results pertain only to that scale. However, when discussion applies to the broader construct the following abbreviations will be used: ES-PA for Extraversion/Surgency/Positive Affectivity; NA-NA for Neuroticism/Negative Affectivity/Negative Temperament; and EC-D for Conscientiousness/Effortful Control/Disinhibition.

Also notable is that both the CBQ and the SNAP-ORF contain a measure of "impulsivity." It is important to note that these measures differ slightly in definition and item content. CBQ impulsivity is defined primarily by speed of response to stimuli, typically approaching new situations. CBQ impulsivity is thus placed within the larger, Surgency factor, which is consistent with the concept of impulsivity as characterized by 'boldness' and approach behavior (e.g., Eyesenck, 1990). In contrast, SNAP-ORF impulsivity is placed within the cluster of Disinhibition-related traits, and is defined more as "nonplanfulness" and a tendency to live within the moment without consideration to future outcomes. Thus, despite sounding similar, the scales measure somewhat differing constructs (see Whiteside & Lynam, 2001 for a discussion of various definitions of impulsivity).

Children's Behavior Questionnaire—Short Form (CBQ)

The Children's Behavior Questionnaire (Rothbart, Adahi & Hershey, 1994; Rothbart, Adahi, Hershey & Fisher, 2001) short form (Putnam & Rothbart, 2006) consists of 94 items rationally derived to assess temperament in children age 3-7

years. It consists of 15 primary temperament characteristics falling under three higher order, factor analytically derived dimensions: Extraversion/Surgency (E/S; subscales: Activity Level, Impulsivity, High Intensity Pleasure, and Shyness), Negative Affect (NA; Anger/Frustration, Discomfort, Fear, Sadness, and Soothability), and Effortful Control (EC; Attentional Focusing, Inhibitory Control, Low Intensity Pleasure, and Perceptual Sensitivity). Verbal descriptions for CBQ scales appear in Table 2. Two additional scales not intended to be associated with a higher order factor are Approach/Positive Anticipation and Smiling/Laughter. Alpha reliabilities for the CBQ scales range from .56 (Sadness) to .86 (Shyness), with an average of .69 (Putnam & Rothbart, 2006).

Schedule for Nonadaptive and Adaptive Personality—Other Report Form (SNAP-ORF)

The SNAP-ORF (Harlan & Clark, 1999) is an alternative report form for the full SNAP/SNAP-2 (Clark, 1993), which assesses 15 pathological personality traits relevant to adult personality disorder. It consists of 33 items assessing elements of three temperament dimensions—Negative Affectivity (NA), Positive Affectivity (PA), and Disinhibition versus Constraint (DvC)—including items that assess the core of these three broad factors (negative temperament, positive temperament, disinhibition) and 12 specific traits (mistrust, manipulativeness, aggression, self-harm, eccentric perceptions, dependency, exhibitionism, entitlement, detachment, impulsivity, propriety, and workaholism), associated factorially with the 3 core temperament scales. Items are presented in short paragraph format, and the responder is asked to rate targets' personality on a six-point Likert-type scale,

ranging from “Very Much Like” the low end of the trait to “Very Much Like” the high end of the trait. The scales are assessed using two or three items, except for eccentric perceptions which is assessed with a single item. Verbal descriptions for SNAP-2/ SNAP-ORF scales appear in Table 3.

The SNAP-ORF scales have shown acceptable internal consistency reliability for parental reports of their children in college (median α=.65 [fathers], .69 [mothers]; Harlan & Clark, 1999) and middle and senior-high school (median α=.65, Linde, 2002; median α = .69, Latzman, Lilienfeld, Latzman, & Clark, 2012), as well as moderate agreement between mothers’ and fathers’ ratings of their children in college (median *r* = .52; Harlan & Clark, 1999) or in middle and senior-high school (median *r* = .47; Linde, 2002). Correlations between parental SNAP-ORF scores and youth self-report using the adolescent version of the SNAP (SNAP for Youth: SNAP-Y; Linde, Stringer, Simms, & Clark, 2012) were comparable for those typically found for personality traits (median *r*s = .30 and .35 in the middle and senior-high school samples of Linde (2002) and Latzman et al. (2012), respectively. More generally, multiple researchers (e.g., Cukrowicz et al., 2006) have generated results suggesting that caregivers provide useful information about individual differences in children.

The SNAP-ORF was modified slightly in three ways for this study. First, “your child” was substituted for “target person” in the rating instructions Second, because the SNAP-ORF has been assessed previously only in children aged 11 and up, it is unclear whether parents of younger children will respond using absolute or age-relevant norms, so we added the phrase “as compared to other children of their

age" to the instructions. Finally, copies of the measure with these two changes were provided to 5 Ph.D. or M.A. level professionals in the area of child psychology and 7 undergraduate-level research assistants supervised by Ph.D.s. Reviewers were asked to critique the measure and to provide suggestions of alternative wording for questions that appeared to target adults only. Resulting suggestions were aggregated, and changes were made if $\geq$ 2 individuals suggested the change. Item changes were minimal, and the amended measure was sent to 6 of the original raters and 7 additional MA or Ph.D. level researchers in personality psychology for final review. No further changes were made at this stage.

Measures: Clinical Data

Clinics included in this study (a) serve a sample of primarily children (modal age < 18) and (b) use a behavioral-analytic approach to assessment and treatment that (c) may include functional-analytic procedures as described previously (also see Brown-Chidsey, 2005; Shapiro & Kratochwill, 1988, 2000; Watson & Steege, 2003). It is typical for clinicians to state the following clearly in all reports: the assessment procedure used, functions formally assessed including the specific session run (e.g., a session establishing environmental control over a problem behavior (Pb) that links behavior to a particular outcome), rate of Pb observed in each session, and functions determined to be clinically present. Clinics typically assess from 1 to 4 broadly defined behavioral functions: attention (-seeking), escape (from demands), (access to) tangible(s), and automatic (internally reinforcing). However, subtle variations may exist within these sessions at the discretion of the clinician: for example, clinicians may elect to manipulate whether an attention

session is run by the parent or by the clinician to test whether attention-seeking is unique to the individual present. Clinic appointments also tend to be fluid and highly individualized; as such, not all participants will receive sessions assessing all functions.

Because clinics vary in set-up and time available, participants did not undergo identical functional-analytic procedures; rather the procedures were those typical for each clinic and determined by the clinician to be most appropriate for each patient. Nonetheless, in practice clinicians in all the clinics frequently used multiple methods to determine behavioral functions under the broad heading "functional assessment (see Hastings & Noone, 2005). For example, one might determine a behavior's functional control by immediately implementing a function-specific treatment; for an attention function, this might include implementing alternative communication, such as a picture card to request attention. Because the treatment is implemented functionally, the absence of the behavior under treatment conditions theoretically determines function, particularly if the behavior re-emerges in the absence of treatment. Finally, behavioral treatment recommendations theoretically should reflect the Pb's function, as the recommendations are selected specifically to address functional behavior problems. Because behavioral treatments are highly fluid and individualized, this type of data best reflects clinical behavior treatment as it currently is practiced.

Clinical data were gathered from client files both in hardcopy directly from the clinics, and in electronic format using the University of Iowa Hospitals and Clinics (UIHC) online medical records system (EPIC). No clinical data were

accessed from a participant until after the consent document has been signed and returned.

A subset of individuals (*n*=29) also had data sheets available from individual client sessions. These data provide information about the client's behavior every 6 or 10 (depending on the clinic) seconds of what are typically 3- to 5-minute assessment sessions. Problem behavior was aggregated by dividing the number of 6 or 10-second intervals that contained a Pb by the number of 6-second intervals in a session. This yielded a percentage of the individual session time in which Pb was noted, which was then compared to (a) a second rater (when available) and (b) the clinician's statement of the Pb in the online medical records. Use of percentage of Pb aggregated across a session is consistent with the "block-by-block" agreement method that is used frequently to index reliability in behavior-analytic procedures (see Mudford, Taylor, & Martin, 2009). Furthermore, it is comparable to using aggregate scores for the temperament scales. Note that percent of Pb observed is rated within test sessions such as attention or escape, not aggregated across all sessions. Thus, results may show aggregate rates of problem behavior greater than 100%.

Electronic data from hospital and clinic records were accessed online via the University of Iowa Hospitals and Clinics version of "virtual desktop," a user interface system. Acceptable reliability was defined as inter-rater agreement kappas of .90 or higher on all variables (see "Research Assistant Training"). Previous work in this lab has had acceptable levels of interrater agreement for client data drawn from clinic files for both objective (e.g., demographic; $r \sim .8$-.9) and subjective

(e.g., trait ratings; *r* ~ .6-.8) data (Morgan, Clark & Tyrer, 2010). Specific variables of interest are defined below.

Behavioral Function

Function was determined using a chart-review procedure following each participant's clinic appointment. Reports were posted to the UIHC system within 1 week of the clinic appointment, and accessed within 1 week of receiving written consent from parents to access the child's clinic records. All clinicians were individuals with a Ph.D. level of education, or graduate students supervised by Ph.D.-level clinicians. Function was assessed in three ways.

First, the type of behavioral assessment was coded according to the clinical statement of "tests administered." When multiple reports existed, only the record from the time of clinical recruitment was used. Data on function were coded only if they were drawn from direct clinical observation (i.e., not if indicated as by history or parent report from records).

Four main functions were coded: attention, (access to) tangibles, escape (from demands) and "internal/automatic" for behavior that occurs during alone conditions. Finally, function was noted as "other" in cases for which either no clear function could be identified, or a separate function that did not fall into one of the study's four broad categories was noted. Results were coded on a categorical scale from 0-2: 0 indicated no evidence was found for the presence of a given function; 1 indicated a function was suspected based on clinical observation and/or parent report, but problem behavior was not directly observed under test conditions; and 2

indicated a function was assessed and behavioral evidence was found to support the presence of that function (effectively, “not present,” “suspected,” and “present”).

Second, because treatment recommendations are linked theoretically with results from clinical analysis, treatment recommendations were coded into the following categories (adapted from Didden, 2007, Table 4.1): functional communication training (for attention, tangibles, and/or escape); time out; routines or schedules (RT; e.g., using picture schedules to schedule activities visually over a set period of time); praise/attention; positive reinforcement for behavior change (RFT+ for attention, tangibles, or escape); scheduled access to tangibles (e.g., making a “treasure chest” of toys available only under certain conditions, such as under divided attention); scheduled access to parental attention or activities (e.g., scheduling “calendar time” when a child is given access to parental attention and/or high preferred activities non-contingent on behavior); referrals for more testing/treatment (e.g., neuropsychological or diagnostic evaluations). Common treatment recommendations from referring clinics are detailed in Table 4.

The third measure of function was defined as “percent of intervals in which Pb occurs” as reported by the clinician for relevant test sessions (e.g., % Pb under attention, escape, or tangible test sessions). In cases with more than one test session (e.g., two attention sessions), percent of Pb was averaged across both intervals. Importantly, since not all participants were tested for all possible functions, percent of problem behavior under tested conditions was only available for functions tested in the clinic.

Behavioral Form

As with function, form of Pb was determined using a chart-review procedure following each participant's clinic appointment. Broad categories for the forms of Pb included: (1) aggression: any behavior that results in or could result in tissue damage to another person (e.g., hitting, kicking); (2) destruction: any behavior that damaged or could damage physical items (e.g., breaking toys); (3) self-injury: any behavior that results in or could result in tissue damage to the self (e.g., self-scratching, head banging); (4) verbal outburst: any vocal behavior that is non-communicative and/or overly loud or disruptive (e.g., screaming); (5) elopement: any behavior that centers around children physically removing themselves from the room and task at hand; (6) noncompliance: any behavior that involves refusal to complete tasks or comply with requests; and (7) other: any behavior that does not fit in any of the preceding categories.

Frequency and Severity

Frequency was coded in the clinic report according to whether the behavior was observed in clinic, and also was rated from 1 (multiple times daily) to 5 (less than once each week) by clinicians for a subset of participants. This rating was made based on reports of frequency provided by parents, teachers, or other adults communicating with the clinician. A severity estimate was made (1) by summing the total number of discrete Pbs reported by parents or other adults, and (2) by clinician-rating ranging from 0 (low severity) to 5 (high severity).

Procedure

Participants were recruited either immediately prior to or at scheduled appointments at one of four behavior treatment clinics at the Center for Disabilities and Development at the University of Iowa Hospitals and Clinics (previously described). Parent(s) of children aged 2-10 were asked by clinicians whether they were interested in being contacted by a researcher at one of two times: first, at a pre-clinic phone call; or second, in-person during or after the clinic assessment. If consent to be contacted was given, clinicians passed contact information directly to the research team who then contacted parents via telephone to provide details about the study to the parents directly. If the parents consented via telephone to participate, study paperwork was mailed to the home, including: a letter describing the study, two consent documents, a stamped/addressed return envelope, and copies of two temperament measures to be completed about the child. The letter detailed that the study was separate from the clinic and that study participation was voluntary and did not affect their clinic appointment in any way. Experimental materials were mailed out directly to the parents if contact was not made after at least 4 attempts, and at least 1 month had passed since the original clinic appointment.

Research documents were then completed by the parents and mailed directly to the experimenters in the return envelope provided. Initially, the questionnaire was available online, but this option was discontinued when no participants elected to provide information online after recruitment had been ongoing for 1 year. The entire process was estimated to take most caregivers from 30 to 40 minutes. No

compensation was provided for participation to the parents directly as stipulated by the clinics. However, approximately $500 USD obtained through grants/awards was made available to recruiting clinics for purchase of clinic materials. Following this procedure, 53 participants (of 127 names given by clinicians; 41.7%) were recruited and completed the procedure in its entirety. An additional 46 participants (36.2%) indicated they had interest in the project, but ultimately did not return materials, and 28 (22%) declined to participate or were not reached by telephone and did not return completed materials.

Once consent was received, hospital/medical records were used to obtain demographic information and results from the child's clinic appointments, as previously described. Full clinic records (including 6-second or 10-second data sheets) were available for a subset of participants (*n*=19).

Research Assistant Training

Undergraduate research assistants (RAs) were used as team members throughout the project. Their role was twofold: First, they served as the primary point of contact for participant questions and concerns, for which role they were trained in basic tenets of temperament, personality, and behavioral analysis, and demonstrated comprehension of this study in particular (determined informally through discussion with the PI), so they were able to respond to participant questions and concerns. If the RA was unable or uncertain how to address participant questions, the PI was consulted and the participant was subsequently recontacted by either the RA or the PI.

Second, undergraduate RAs also were trained to access and enter patient data from hospital records. RAs first were trained in accordance with guidelines required to access confidential patient data from the University of Iowa Hospitals and Clinics online medical records (EPIC). RAs then accessed these files from a secure laboratory computer using virtual desktop. All data were entered twice, once by an RA and once by the PI. Disagreements were reconciled by re-accessing clinic records in the presence (e.g., physical presence or via conference call) of both individuals, and agreement was reached about these items. This procedure resulted in 100% interrater agreement (kappa=1.0 for all variables).

RESULTS

Measures: Individual Differences

All participants returned both personality measures, and the full sample (*N*=53) was retained for analyses. Missing items were imputed within each measure using SAS proc mi with 7 iterations, a regression-based estimation procedure which includes an error term to simulate actual data (vs. imputing missing values that are more reliable than actual data).

Final descriptive statistics for the CBQ and SNAP-ORF appear in Table 5. These values were broadly consistent with previous reports for both measures. Alpha reliabilities fell between .52 to .85 (*M* = .72; *M* average interitem correlation [AIC] =. 32) for the CBQ, and between .68 and .85 for 14 of the 15 SNAP-ORF scales (*M* = .63; *M* AIC = .56). The exceptions were workaholism (alpha = .60; AIC = .43) and self-harm (alpha = .44; AIC = .28), indicating that the items comprising these scales are not strongly intercorrelated in our sample.

Correlations among scales of personality measures appear in Tables 6 (CBQ) and 7 (SNAP-ORF), and correlations between the 2 measures appear in Table 8. CBQ factor scores were based on sum scores, as indicated in the CBQ manual. Relations among theoretically related traits were generally as anticipated for both the normal-range (CBQ) and pathological (SNAP-ORF) measures, and consistent with the presence of three, higher order temperament variables: E/S-PA, NA-NA, and EC-D. Interestingly, both the additional scales—Approach/Motivation and Smiling and Laughter—showed strong correlations with scales from the E/S factor. In fact, both measures provided equal or better correlations with the E/S overall

factor than did shyness. For the CBQ, average convergent correlations (excluding the part-whole correlations between scale and factor scores) were strongest for E/S scales (*r*=.53) and moderate for both the NA and EC scales (*r*= .32 and .23, respectively). In contrast, average discriminant correlations for all scales excluding the putative "additional" scales were low for the E/S (*r*=-.02), NA (*r*=.03), and EC factors (*r*=.02).

In the SNAP-ORF, highest correlations for individual scales generally were found within temperament "clusters" (i.e., within trait groups identified as comprising the NA, PA, and DvC factors per the SNAP-2 manual). However, there were two exceptions: Eccentric Perceptions correlated most strongly with Impulsivity (*r* = .33) and Dependency correlated most strongly with Propriety (*r* = .34). In addition, there were a few other notable high cross-factor correlations, which also have been observed in adult data. The following correlations all fell between .40- and .50: Manipulativeness with Exhibitionism and Entitlement, Mistrust with Detachment, and Aggression with Entitlement and Disinhibition. Convergent correlations were moderate for the PA and Disinhibition factors (*r*= .31 and .32 respectively), and small for the NA factor (*r*=.17). As with the CBQ, average discriminant correlations were near-zero for the NA (*r*=.03), PA (*r*=.08) and Disinhibition factors (*r*.=02). Because they do not represent part-whole correlations, overall temperament scores were retained for calculating the convergent and discriminant correlations on the SNAP-ORF.

Modeling the Children's Behavior Questionnaire

MPlus version 6 was used to conduct a confirmatory factor analysis of the CBQ. Consistent with the CBQ manual, three latent constructs were assessed: E/S, consisting of Activity Level, High Intensity Pleasure, Impulsivity, and Shyness (negatively keyed); NA consisting of Anger, Discomfort, Fear, Sadness, and Soothability (negatively keyed); and EC, consisting of Attention Focusing, Inhibitory Control, Low Intensity Pleasure, and Perceptual Sensitivity. Results appear in Figure 2. Fit statistics uniformly suggest this structure does not provide a good fit for these data (Comparative Fit Index=.45; Tucker-Lewis Index=.31; Root Mean Square of Approximation=.19; Standardized Root Mean Residual=.15). Examination of factor loadings (Figure 2) also suggest a poorly fitting model. Low loadings were particularly evident for Effortful Control, where 2 of 4 scales (Perceptual Sensitivity and Low Intensity Pleasure) did not yield significant parameters. The highest loading on any factor was Impulsivity on E/S, which suggested an unclear representation of the larger temperament factor (see Sharma et al., in press for a discussion of the relation between "impulsivity" and extraversion).

Due to the poorly fitting CFA model, an exploratory principal factors analysis (i.e., with squared multiple correlations in the diagonal) was conducted. Because the two additional tables showed high correlations with other scales—particularly within the surgency construct—these scales were included in the analysis. Examination of the scree plot suggested a three-factor solution, which accounted for 82% of the common variance. Because the factors were expected to correlate, a promax rotation (power=3) was performed yielding three interpretable

factors. Table 9 reports the complete factor-loading matrix for the three-factor solution. The first rotated factor accounted for 37% of the common variance and was characterized by measures of smiling/laughter, high- and low- intensity pleasure. This factor seemed most akin to theoretical concepts of ES-PA, and corresponded by definition with Rothbart's description of "surgency" (*r* =.83 with summed score for E/S), although it differed from somewhat from the CFA in that measures of overt displays of positivity and pleasure overall loaded strongly on the factor, including the two additional scales of Approach/Positive Anticipation and Smiling and Laughter.

The second factor accounted for 26% of the common variance, and was best defined by discomfort, sadness, and fear. Thus, the factor appeared to correspond well with theoretical constructs of negative affectivity/neuroticism in the CBQ and, in fact, correlated .94 with the summed score for the NA factor. Finally, the third factor, which accounted for 19% of the common variance consisted of inhibitory control and attentional focusing, and appeared to correspond most closely to constructs of conscientiousness and "effortful control" versus disinhibition, correlating .83 with the summed score for the EC factor. Correlations between factors were low: -.15 (E/S with NA), -.16 (E/S with EC), and .24 (NA with EC).

Correlations of the CBQ with the SNAP-ORF and regression-based factor scores are shown in Table 8. In two of three cases (EC with DvC and ES with PA), the EFA regression-based factor scores yielded stronger correlations with theoretically related SNAP-ORF temperament scale than did the summed scale scores. EFA factor scoring yielded a slightly lower factor correlation with SNAP-

ORF negative temperament than did sum-scores (.47 vs. .58). In addition, I averaged the correlations of each CBQ factor—scored both using sum scores and using regression—with the scales comprising each of the three higher order SNAP factors (e.g., the correlations between Surgency and SNAP-ORF positive temperament, exhibitionism, entitlement, and detachment (reversed, so all correlations are positive), and the results were quite similar. Specifically, the Surgency—PA correlation was .57 for the regression-based factor scale and .44 for the sum score; the NA-NA correlations were .26 and .27, respectively, whereas those for EC were .30 and .22, respectively.

Further, the regression-based factor scores had a stronger convergent-discriminant correlational pattern. For example, the discriminant correlation between CBQ Surgency and SNAP DvC was .16 for the regression-based scores but .22 for the sum scores (vs. .30 and .22 convergent correlations; thus for the sum score, the convergent correlations was the same as one of the discriminant correlations). Because regression-based factor scores provided an alternative, slightly superior fit to the data, subsequent analyses prioritized the regression-based scores except in cases such as zero-order analyses where both results could be easily presented.

Measures: Clinical Data

Behavioral Form

Table 10 shows the frequency of behavioral topography (form) reported in clinical documents. The most common was aggression (73.6%), most commonly hitting, kicking, or biting. Also common were tantrum (60.4%), noncompliance

with requests (58.5%), and destruction of property (45.3%). Problem behaviors reported ranged from 1 to 12 unique behaviors (mean=5.51, SD=2.58).

Behavioral Function

The type of analysis conducted appears in Table 11. The majority of patients (60.4%) received either a functional analysis or a brief functional analysis. Less frequent were antecedent analyses, choice assessments, or behavior treatments (without preceding analysis). The majority of participants (*n*=42) had a recorded rate of Pb in test sessions conducted at the clinic, including: 38 free play, 32 attention, 34 demand, 12 tangible, 3 alone, and 8 "other" testing sessions. When more than one of the same kind of session was run, rate of Pb was averaged across all identical sessions. Reliability data (i.e., more than one clinician completed the 6 or 10 second data sheets for test sessions) were available for 22 participants. Interobserver reliability was calculated for every block (6 or 10 seconds) as "agreement" if 100% of ratings in that block corresponded across raters. For the patients who had these data, mean interobserver reliability was 93% (SD=2.2%; range=84-100%), which is consistent with previous results published for these clinics (see Derby et al., 1992).

As detailed in the methods, the function of behaviors were assessed in three ways: First, categorically using function is absent (0), function is suspected (1), and function is present (2) by clinician report; Second, percentage of sessions in which Pb occurred; and Third, treatment recommendations targeted to treat a specific behavioral function. Rates of clinician report for function (from 0 up to 3 functions) are shown in Table 12. Attention and Escape (from demands) were the most

commonly reported functions by clinician description. Rate of treatment recommendations appear in Table 13. The most common treatment recommendation (noted for 100% of cases) was to provide positive social reinforcement (praise) for desired behavior.

Descriptive statistics for all function measures appear in Table 14. Consistent with the finding that attention and escape were the most commonly occurring functions (Table 12), these functions showed higher base rates, range, and mean scores across measures. In contrast, tangible, automatic, and "other" functions were less common and variable overall. The rate of Pb observed in the clinic was low, and nearly half the patients did not demonstrate observable Pb during any sessions (n = 23, 43.40%). Thus, these variables drew from a limited sample size and showed less variance overall.

Correlations among functions varied widely, both within and between types of function (see Table 15). Average correlations among function types (collapsing all three measures) appear in Table 16. In general, highest correlations were noted among different measures of the same function. The majority of correlations within measures of attention, escape, and tangible functions were small to moderate (rs' from .30 to .45). Interestingly, significant, negative relations were found between Pb observed in tangible sessions and two of three measures of attention. Perhaps due to the low incidence of automatic and 'other' functions, few significant relations were found for these functions even within measures of the same function. Thus, although different measures of function appeared more related to each other than to measures of other functions, these relations were generally smaller than

would be expected for measures of function, which should theoretically have a basis in observed behavior. As such, the measures of function used in this project do not provide equivalent indices of behavioral function for this sample. Moreover, a model using all three measures of function to create a latent variable for "function" did not converge even when the variance(s) of the observed variables or the latent variable were constricted. Because of low correlations between functions, subsequent analyses relating function to personality or other variables were conducted separately for each measure of function (i.e., rather than creating a latent variable of "attention," "escape," and "tangible" functions).

Frequency and Severity.

Frequency was defined as (1) the average rate of Pb observed in the clinic and (2) clinician rating of frequency on a 0 to 4 Likert-type scale. Severity was defined as (1) sum of all types of Pb detailed in the presenting problem and (2) clinician rating of severity on a 0 to 4, Likert-type scale. Descriptive statistics for these variables are shown at the bottom of Table 13. Frequency of Pb occurring in the clinic was low in general, with many participants not demonstrating Pb in the clinic at all. In contrast, clinician's rating of frequency—which may be based on previous assessments; or parent, teacher, or other adults' report—was relatively high (mean=3.46). For severity, the sum of Pb types varied from 1 to 11 distinct Pbs, with an average of almost 5 behaviors. In contrast to frequency, clinician rating of severity was relatively low, suggesting that patients were referred for high frequency but low severity behaviors overall.

No pattern of correlations among frequency, severity, or measures of functions was found (Table 17). Clinician rating of frequency and severity showed a high, negative correlation suggesting that high-severity behaviors are reported to occur less with frequently than low-severity behaviors. The only other significant result was a negative correlation between clinician-rated severity and treatment recommendation for attention functions.

Relations Between Temperament and Behavior

Behavioral Form

The majority of significant findings for relations of behavioral form with personality involved aggressive and tantrum behavior (Table 18). Specifically, behavioral aggression was positively correlated with SNAP-ORF aggression and disinhibition, and negatively correlated with CBQ soothability, effortful control, low intensity pleasure, and the EFA effortful control factor. This pattern suggests that behavioral aggression is characterized by spontaneous action without regard for consequences and several components suggesting low conscientiousness. In contrast, behavioral tantrums were positively associated with SNAP-ORF manipulativeness, and negatively associated with SNAP-ORF dependency and CBQ impulsivity, suggesting that tantrums are viewed as more planful behaviors overall.

With the exception of CBQ perceptual sensitivity, no significant relations were found between personality traits and frequency of Pbs (Table 18). SNAP-ORF manipulativeness, aggression, and self-harm were all positively related to severity as defined by the sum of behaviors identified as the presenting problem, reflecting

the high rate of aggression and SIB in this population. In contrast, CBQ low intensity pleasure and soothability were negatively related to sum of presenting Pbs.

Attention Function(s)

Table 19 shows zero-order correlations among personality variables and function. Of particular interest was(were) the hypothesized, significant correlation(s) between attention function(s) and E/S-PA. Results from the SNAP-ORF generally support this hypothesis, with significant, positive correlations noted between clinicians' statement of function and positive temperament. Significant, positive correlations also are noted for exhibitionism and entitlement, and a significant negative correlation is reported for detachment (which also correlates negatively with scales from this group). In contrast, only detachment correlated significantly with a second measure of attention (treatment recommendations), and only exhibitionism correlated significantly with the percent of Pb observed under attention sessions.

With respect to the CBQ, no E/S-factor scales correlated significantly with any measure of function, including those measuring attention. However, the two additional scales that were not included in the summed scores per the author (but loaded highly on the EFA results for E/S) showed positive correlations with measures of attention function: smiling/laughter with clinician statement of attention, and approach/positive anticipation with percent of Pb observed under attention sessions. Regression-based factor scores were used to correlate EFA results with function. Consistent with the SNAP, these results show a significant, positive correlation between (EFA) surgency and clinician statement of function.

Looking at the data another way, clinicians' reports of function correlated in the expected direction with 6 of 11 (55%) of the measures of E/S-PA: 1from the original CBQ, 1 from the CBQ EFA; and 4 from the SNAP (100% of the relevant SNAP-ORF scales). In contrast, function as defined by rate of Pb in attention sessions and recommended treatment for attention each correlated significantly with only 1 of the 11 (9%) possible measures of E/S-PA (SNAP-ORF entitlement) . Finally, function as defined by treatment for attention also correlated with 1 of the 11 possible measures of E/S-PA (*r*s = .44 for SNAP-ORF detachment and rate of Pb, and -.35 for SNAP-ORF detachment and treatment recommendation). Thus of the three measures of function, clinicians' reports of function appeared most related to the personality variables of E/S-PA. Other than for E/S-PA, few additional correlations with measures of attention function were observed. Exceptions included a -.31 correlation with SNAP-ORF disinhibition, and a .31 correlation with low-intensity pleasure from the CBQ.

Escape Function(s)

Also hypothesized was a general contribution of negative affectivity/negative temperament to attention and escape functions specifically, and all Pb generally. This hypothesis was not supported by the current data. Only two significant correlations were found for measures of escape function and any personality variable: SNAP-ORF negative temperament correlated .28 with treatment for escape, and SNAP-ORF disinhibition correlated .37 with percent Pb observed under escape sessions. No significant relations with any personality variable were reported for clinicians' reports of escape.

Tangible Function(s)

No specific hypotheses were generated with regard to the tangible function. However, results were most notable when function was operationalized as treatment recommendations. Here, tangible function was significantly, negatively correlated with scales of both positive and negative temperament, including 3 scales of positive temperament in the SNAP-ORF (positively with detachment, and negatively with exhibitionism and entitlement); negative correlations with 2 scales from SNAP-ORF negative temperament; and negative correlations with four scales of negative affectivity in the CBQ. These correlations ranged from |.28| to |.49|, with a mean of |.34| (omitting the CBQ sum score correlations in favor of that with the CBQ regression based factor score). Treatment for tangible was also significantly, negatively correlated with the CBQ EFA Negative Affect factor (r = -.39). Clinicians' report of function was less strongly related to personality variables, but also reflected negative correlations with negative affectivity scales in the SNAP-ORF and CBQ.

Automatic and Other Function(s)

Few significant findings were reported for either automatic or 'other' functions, perhaps because the frequency of these functions was notably lower than for attention, escape, or tangible (see Tables 13 and 14). Negative correlations were found between clinicians' report of automatic function and SNAP-ORF positive temperament (r = -.32) and between CBQ sadness and percent Pb observed under automatic conditions (free play and/or alone; r = -.36). Also found was a negative correlation (r = -.31) between clinicians' report of other functions and CBQ

effortful control. This only one of two significant findings for any measure of CBQ effortful control (including the EFA).

Structural Modeling Using Temperament and Behavior

Figure 1 shows the hypothesized relation between personality and function. Here, a shared contribution of negative affectivity is shown for both attention and escape functions, and a unique, positive contribution was expected from surgency to attention function. The unique contribution of positive affectivity/surgency/extraversion to attention was partially supported by the findings from the zero-order analyses, primarily with respect to clinicians' report of function. However, the shared contribution of negative temperament/affectivity to both attention and escape functions was not supported, and only low correlations were found for negative temperament/affectivity and any behavioral function.

Structural modeling using function as a latent variable was not conducted due to low correlations limiting the number of observed variables that could be used to construct latent variables for attention, escape, or tangible functions. Instead, the model was tested three times, once for each definition of function. Temperament was modeled using results from both the SNAP-ORF and CBQ to model latent variables for E/S-PA and Na-NA (Figure 3). To maintain model parsimony, CBQ regression-based factor scores were used rather than creating additional latent variables as part of the SEM. The CBQ EFA was used in place of the CBQ factor sum scores based on higher intercorrelations with the SNAP-ORF and more consistent relations with functional outcomes in zero-order results. Importantly, all

structural modeling results should be interpreted with caution, due to the relatively low sample size used (see Barrett, 2007).

Parameter estimates for all hypothesized paths (per Figure 1) were included initially in all models. However, in all cases relations between NA and function (both attention and escape) were non-significant, and so were dropped from the model. This is consistent with zero-order results showing few significant relations between these constructs. Moreover, dropping these parameters improved model fit in all tested models.

Results from structural modeling supported the unique contribution of positive temperament/surgency/extraversion to attention (Figure 3) when function was defined using clinician report. Fit statistics appear in Table 20, and parameter estimates are shown in Table 21. Clinician report of function also produced the best fitting model, with fit statistics in the broadly acceptable range for all indices (cf. Bollen & Long, 1993; Hopwood & Donellan, 2010). In contrast, parameters linking temperament to function for models using function as defined by treatment recommendations or Pb observed in sessions were not significant. However, model fit indices suggest these models may provide an acceptable (if not optimal) fit for the data when using variables such as personality or temperament in the model (Hopwood & Donellan, 2010).

Path analyses were conducted replicating the model found in SEM results (Figure 4) for the two scale-level traits that showed significant correlations with at least 2 measures of escape or attention function (SNAP-ORF detachment and SNAP-ORF entitlement). The path analysis was also conducted with SNAP-ORF

exhibitionism because it is a trait defined by attention-seeking, and thus most theoretically thinking to this function. Fit indices for these models are included in Table 20, and parameter estimates appear in Table 22. Fit indices (CCFI, TLI, RMSEA, and SRMR) fell in the broadly acceptable range. Parameter estimates were strongest overall for models using detachment as a measure of E/S-PA, and both paths were significant for 2 of the 3 measures of function (clinician statement and percent problem behavior). Both tested paths were also significant for exhibitionism and clinician statement of function, and entitlement and percent problem behavior.

Temperament and Diagnostic Categories

A secondary goal of the study with regard to temperament was (1) to provide descriptive information about temperament for diagnoses where such data are not established, and (2) to compare diagnostic groups on dominant traits when sufficient sample size for comparisons is available. However, neither medical nor psychiatric diagnoses varied substantially within broad categories of diagnoses. For example, all but 3 participants were diagnosed with disruptive behavior disorder (Table 1). Not counting the heterogeneous "other" categories ("other psychiatric disorder" or "other medical condition"), only three diagnostic categories had a sample size of 10 or higher: Attention-Deficit/Hyperactivity Disorder (n =10), Pervasive Developmental Disorder NOS (n =10); and Language Disorder (n =13). However, when overlap between diagnoses was taken into account, the number of unique cases within these three groups (i.e., where only one of the three diagnoses was

present) fell below 6 for each group. As such, comparisons between diagnostic categories could not be performed due to insufficient sample size for any category.

DISCUSSION

All behavior occurs in a specific context, including behaviors observed under tightly controlled conditions. However, the specific nature of contexts with respect to organism variables only recently became a focus of study. Initially, the context of behaviors was defined as stimulus parameters external to the individual (such as stimulus control or social context; Taylor, Sisson, McKelvey & Trefelner, 1993), although later the concept of changeable biological determinates affecting behavior also were included (Carr et al., 1980): for example, the effects of substances (e.g., caffeine, Podboy & Mallory, 1977), exercise (Baumeister & McLean, 1984), physical illness (e.g., Gunsett, Mulick, Fernald & Martin, 1989), or menstrual discomfort (Taylor, Rush, Hetrick & Sandman, 1993). Thus, it is increasingly an accepted tenet in behavior analysis that attributes unique to the organism can have a significant effect on behavior problems.

By definition, personality qualifies as 'an attribute unique to an organism," although it has been the subject of little to no research in behavior analysis. Recent research has documented that there is a strong genetic component to temperament/ personality, which previously has been established as a consistently reported, observable variable of individual differences (e.g., Ando et al., 2004; Krueger et al., 2002; Krueger & Tackett, 2007; Mervielde, De Clercq, De Fruyt & Leeuwen, 2006). To my knowledge, this is the first study examining personality as it relates to behavior analytic outcomes. Thus, the study was largely exploratory by design, and results—particularly those using SEM or path analysis methods—are interpreted with caution due to the relatively small sample size for these methods.

Modeling Temperament

The study's first hypothesis was that previously identified temperament/ personality models of the CBQ and SNAP-ORF, consisting of E/S-PA, N-NA, and EC-D as broad temperament factors, would replicate. The results broadly supported the model in both measures: Four of the six average convergent correlations of lower order scales forming each higher order factor ranged from .31 to .33 and the two outliers were a small correlation (r = .17) for the SNAP-ORF NA factor and a moderately strong one (r = .53) for the CBQ Surgency factor. The somewhat lower convergence for the SNAP-ORF likely stemmed largely from an emphasis on scale independence in its development. Conversely, near-zero average discriminant correlations (r from .02 to .08) were reported for all theoretically unrelated scales within each instrument. Convergence across measures was also in the acceptable range, with correlations between the higher order temperament factors averaging to .72 for S/E-PA, .66 for N-NA, and .54 for EC-D (including correlations between the SNAP-ORF, CBQ summed scores, and CBQ EFA scores; see Table 8). These findings replicate those showing a shared, hierarchical structure common to both abnormal and normal personality (see Clark, 2007; Markon, Krueger, & Watson, 2005).

Contrary to expectations, however, the CBQ factor structure did not replicate in the CFA. There are several possibilities for why this might have occurred. First, the relatively small sample size would typically preclude SEM analyses, particularly for personality measures, which are known to provide relatively poor fits in structural modeling (Hopwood & Donellan, 2010). Another consideration is that the

CBQ and SNAP are both products of "bottom-up" construction, which typically provides a poorer fit for CFA analyses than measures that were constructed "top-down." This is because the former focuses on developing scales for a set of theoretically relevant traits and subsequently examines the structure that emerges within this set, whereas the latter first identifies the higher order traits of interest and then proposes facets contributing to those traits, in effect building factors by design. Finally, the inclusion of the two additional scales of approach/positive motivation and smiling and laughter strengthened the Surgency factor in the CBQ, as these scales were significantly associated with other scales in this broadly defined factor (see Table 6).

Behavioral Function and Form

Attention and escape were the most commonly reported behavioral functions in this sample, with comparatively low base rates for the remaining three functions recorded (tangible, automatic, and "other"). This finding was consistent across all measures of function with the exception of percent problem behavior, in which case tangible was observed frequently as well (see Table 14). Attention and escape functions also showed the highest agreement across the three measures of function used (percent behavior recorded, clinician rating, and treatment recommendation): r= .32 and .31 respectively, versus .08 - .17 for the remaining functions (see Table 16). Thus, in addition to being the most commonly reported functions, these functions were also the most reliably reported in the current sample.

Correlations Among Measures of Function

One of the defining features of behavior analysis is its reliance on replicable demonstration of events controlling the occurrence or non-occurrence of behavior (Baer, Wolf, & Risley, 1968; Hastings & Noone, 2005). Using this model, a functional assessment is derived to test specific hypotheses about the processes maintaining behavior. In the current study, the most common hypotheses tested were that the behavior was maintained by attention, by escape from demands, or by access to tangibles such as toys. Functional assessment typically is conducted under well-controlled conditions with observations made regularly regarding the rate of problem behavior under various manipulations. Thus, publications reporting functional assessment results rely on rate of behavior under various conditions to demonstrate environmental control over the behavior.

Clinically, functional assessment as defined by rate of problem behavior under various conditions is only the first step. Secondarily, clinicians must interpret the findings, which frequently are more ambiguous than the clear, controlled examples typical of publications. Finally, treatments are derived based on hypotheses about the processes maintaining a behavior. For example, if access to parental attention is hypothesized to control the behavior, the treatment should target attention specifically (e.g., by providing alternative communicative processes as in functional communication training; Carr & Durand, 1985).

The current study used three measures of function to reflect the full clinical process described above. First, percent problem behavior under test conditions was recorded. Second, clinician statements of function were coded with, effectively,

"not present," "suspected," and "present" for the corresponding observed behaviors in the clinic during test sessions. Finally, treatment recommendations identified as targeting a specific function were tallied. Theoretically, high correlations should have been observed between these three measures because each is defined in part by the other.

Contrary to expectations, results showed a broad range of zero-order correlations between the different measures of function. In fact, the range was sufficiently broad that a model creating a latent variable of "function" defined by the three measures of function yielded a non-converging model. Notably, non-convergence occurred even when the model was limited to only the two most commonly reported functions (attention and escape; see Table 12) with the highest overall correlations between measures (see Table 16). Taken together, these results indicate that the measures of function were not particularly highly related, especially in the case of lower incidence functions such as tangible, automatic, and the broadly defined "other." This finding suggests that one or more of the measures was not a good measure of function or contained such high error variance that the common variance among the measures could not be detected.

There are several more specific possibilities why the current results show low convergence between definitions of function. First, most notable, is the low rate of problem behavior observed in the clinics overall. Consistent with the tenets of clinical behavior analysis, the results relied heavily on the presence/absence of problem behavior in the clinic and two of the three measures of function either directly measured or were affected by this fact: Nearly half of the current sample (*n*

=23; 43%) did not demonstrate observable problem behaviors during clinic appointments.

Importantly, the low rate of observed problem behavior is not unique to this study. Results of several, large-scale studies have shown that it is common for the rate of problem behavior to be insufficient to differentiate between test sessions. For example, approximately 1/10 of patients in a short-term inpatient program did not display any problem behavior at all within the first 3 days of their stay (Asmus et al., 2004). Similarly, Derby and colleagues (1992) reported that approximately a third of individuals do not display target behaviors during behavior assessments. Although the low-rate or non-existent problem behavior presents a challenge for functional assessment, it is representative of naturally occurring clinical assessments. Thus, limiting analyses to only those individuals who demonstrate problem behavior at clinic appointments could provide clearer relations between this variable and function as an observed variable, but would require considerably larger sample sizes.

An alternative to clinical analogue procedures would be to conduct in-vivo observations or assessments, such as in the child's home or school environment where the behaviors were observed previously and thus would be more likely to occur. Such interventions are costly and time-intensive, and necessarily limit control over experimental conditions. An additional confound is the presence of an observer which may serve to alter behavior. Use of more discrete methods such as video streaming or recording technology could limit the effect of an observer on children's behavior, but only if the child is unaware of the observation. As well,

such methods nonetheless would be likely to affect the behavior of adults interacting with the child, who would need to provide consent to place such devices.

Alternative explanations for the low correlations between measures of function include error variance in the clinician statement of function or in treatment recommendations based on observed/stated function. Error in clinician statement of function is most likely when problem behavior is minimal or absent in the clinic, which forces the clinician to generate hypotheses about the function of problem behavior in the absence of that behavior. Such hypotheses may be generated using lower severity behavior that is clinically useful but not recorded as "problem behavior," such as a child who becomes whiny, fidgety, or otherwise visibly distressed under certain test conditions but never escalates to overt problem behavior such as aggression or SIB. Clinically, children are followed for some time to determine the appropriateness of treatment recommendations, and function of behavior may be modified or reconceptualized based on ongoing information from parents, teachers, additional clinic appointments, or in-vivo observations. As such, clinician statement of function in this study may be more appropriately considered the dominant, working hypothesis at the time of assessment. Future research could assess function drawing from in-vivo observations, multiple clinic visits, or some combination thereof to provide a more consistent measure of behavioral function.

The current study also provided evidence for error in treatment recommendations, given that treatment recommendations provided the least consistent relations to other variable (Tables 15 & 16). Moreover, at least one attention recommendation (positive reinforcement/praise for desired behavior) was

noted for all participants regardless of function. Clinically speaking, this is a low-cost and potentially high-return recommendation, in that it takes little of the parents' time to provide praise and could improve behavior in any number of ways. For instance, behavior may change regardless of function if attention is reinforcing to the child, if the parent finds praising reinforcing and thus changes his/her behavior, or simply by improving the parent-child relationship. However, these purported benefits may have introduced a confound into the current analyses, and also have not been examined empirically in children who do not demonstrate an attention function. Future research could address more clearly whether positive attention/ praise augments behavior change in children who do not have an attention function.

Temperament and Behavior

Temperament and Behavioral Function

The primary focus of this study was to provide data documenting relations between temperament and behavioral function. Two significant relations between temperament and function were hypothesized: First, a positive correlation between E/S-PA; and second, a general contribution of N/NA to both escape and attention functions (see Figure 1).

Positive Affectivity

Results from this study showed a significant relation between some measures of E/S-PA and the presence of an attention function for problem behavior. The results were consistent across zero-order correlations and SEM results, which supported a model that also allowed attention and escape functions to correlate. Moreover, results were strongest for trait measures of E/S-PA relevant pathological

traits (SNAP-ORF) as compared to the CBQ, which assesses primarily normal-range traits.

Links between function and E/S-PA were strongest when function was defined by the clinician, and parameter estimates for both identified paths were significant in this model only (Table 21). Although high E/S-PA sometimes is considered protective against development of psychopathology (Bridgett, 2008), components of surgency also have been found to relate specifically to externalizing problems such as aggression (e.g., Lengua, Sandler, West, Wolchik, & Curran, 1999; Rothbart & Bates, 2006). In this case, patients presenting with higher E/S-PA were more likely to be identified as having an attention function for the problem behavior regardless of behavioral topography (i.e., the specific form that the behavior took). This suggests that although it still might play a protective role with regard to internalizing pathology, E/S-PA also may provide a mechanism for the presentation of problem behavior in children who meet criteria for behavior disorders (i.e., externalizing disorders).

Similarly, some of the E/S-PA trait scales—most notably exhibitionism, detachment, and entitlement from the SNAP-ORF—were related consistently to attention function(s) for problem behavior (Pearson *r*s' from |.29| to |.45|, $p \leq .05$). This pattern was clear across all three measures of function, and strongest for clinician statement of function, which yielded significant relations to 6 measures of E/S-PA: all 4 E/S-PA SNAP-ORF scales, CBQ smiling and laughter, and the EFA CBQ factor for Surgency. To clarify these findings, the most significant relations between trait-level scales and function, highest correlations for each measure of

function are presented separately in Table 23. The vast majority of measures in this table are specific trait-level rather than at the level of higher order factors, suggesting that lower order traits better differentiate pathological aspects of behavior (see Bagby et al., 2005; Reynolds & Clark, 2001).

Because this study was largely exploratory, scale-level hypotheses were not proposed. Nonetheless, these results are particularly interesting not only because they are stronger and more consistent than for the larger, temperament characteristics, but also because they paint a more detailed picture overall. For example, the finding that exhibitionism was linked to attention function(s) is very consistent with the trait by definition (Clark, 1993), and also with the concept of attention seeking, an important aspect of *DSM-IV* histrionic and narcissistic PDs (APA, 2004).

Also interesting was the consistent, negative relation between detachment and all definitions of attention function (*r*s' from -.31 to -.45). This finding suggests that children high in detachment are less likely to engage in problem behavior maintained by attention. This too has high face validity: children who lack warmth, empathy, assertiveness, or gregariousness (Reynolds & Clark, 2001), or who do not connect easily with others at the trait level, would logically be unlikely to engage in problem behaviors to seek that connection. In contrast, children high in positive affectivity generally—children who smile and laugh easily and frequently, and who are generally other-directed—would seem unlikely to engage in problem behaviors for exclusively internal, self-reinforcing reasons. Thus, the finding that CBQ smiling and laughter and SNAP-ORF positive temperament (*r*s =

-.33 and -.32 respectively) were associated negatively with clinician-rated automatic functions also makes theoretical sense. Interestingly, and somewhat counterintuitively, Negative Affectivity and, to a lesser extent, its components CBQ sadness and fear also showed a negative (though not significant) relation with automatic function as defined by percent problem behavior in sessions, suggesting that there may be some component to observable affectivity overall—positive or negative—that is negatively associated with internally reinforcing externalizing behavior. A remaining question is whether it is the display of fear or sadness (visible to parents making ratings), the actual internal experience of fear or sadness, or both that is most related to automatic functions.

Similar to exhibitionism, entitlement has definitional components of attention seeking in the form of seeking (frequently undeserved) recognition or praise (APA, 1994; Clark, 1993; Campbell et al., 2004; Emmons, 2010). Moreover, entitlement also has been associated with problem behaviors such as taking candy meant for other children (Campbell et al., 2004), another approach behavior similar to attention seeking. The finding that entitlement was associated with problem behavior under attention conditions (r = .44) suggests that the trait carries a strong attention-seeking component, even at a relatively young age. To date, little research has been done on "pure" entitlement in the absence of narcissism—nor in a child sample generally—so the trait remains somewhat poorly defined. Future research could address more clearly and specific relations among entitlement, attention seeking, and behavioral function and form in children.

Negative Affectivity

In contrast to results for E/S-PA traits, no significant relation was found for N-NA and either attention or escape functions. With a few exceptions, the null findings were consistent across functions for broad temperament as well as for the majority of smaller trait scales associated with N-NA. In fact, contrary to findings linking N-NA to self-reported avoidance motivations (e.g., Carver & White, 1994), N-NA was not uniquely defined by functional behavior problems in any domain.

The general null findings linking N-NA to functional behavior outcomes—particularly with respect to escape/avoidance—was contrary to expectations, in that N-NA frequently is linked to self-reported avoidance motivations (e.g., Carver & White, 1994; Zelenski & Laren, 1999) and to reactivity to aversive events (e.g., Grocc, Sutton, & Ketelaar, 1998). N-NA also has been found generally to characterize a broad range of pathology (Lahey, 2009), including behavior disorders in children such as DBD (e.g., Martel, Gremillion, & Roberts, 2012; Rothbart, 2011; Rothbart & Bates, 2006; Thomas, Chess, & Birch, 1968). N-NA is also one of the first (e.g., Rothbart, 1989) and most stable (e.g., Lemery, Goldsmith, Klinnert, & Mrazek, 1999) temperament characteristics to emerge developmentally, and thus theoretically should have been rated relatively easily by parents. One hypothesis for why N-NA would not be related to function could be restricted range in N-NA traits in this sample (i.e., if all participants were high N-NA). However, examination of descriptive statistics for these measures does not support this hypothesis, and the distributions for N-NA and related traits do not appear significantly different from those for E/S-PA (Table 5). This sample also was characterized to some degree by

patients with developmental delays. It is possible that these patients develop externalizing behavior problems for reasons unrelated to N-NA, such as communication difficulties or family stress (Crnic, Hoffman, Gaze, & Edelbrock, 2004). Because the majority of research on problem behavior has been conducted in a normally developing population, future research could compare these groups to examine whether temperament contributes to problem behavior in the same way across groups of children with varying levels of problem behavior.

The only exceptions to null findings for N-NA traits occurred in the case of CBQ fear, which was correlated negatively with tangible function as defined by treatment (r = -.49) and clinician report (r = -.38) (Table 23). The tangible function is interesting, in that it can broadly refer to a wide variety of reinforcers such as toys, food, or any other item that has an established reinforcing value. Thus it can be thought of as an approach behavior linked to positive reinforcement (Carr, 1994) although, in practice, access to a particular reinforcer also may serve an escape function. For example, a particular toy or activity may be reinforcing because it precludes simultaneous participation in a less preferred activity. The finding that children lower in fear—characterized by worry or distress related to anticipated, fearful situations (Table 2)—were more likely to be perceived as having a tangible function suggests that this function may be more related to low-approach behaviors in the current sample. That is, fearful children were less likely to engage in problem behaviors for access to preferred items, or possibly less likely to approach/seek out those items when they were removed. However, whether this is purely an issue of

low approach (positive reinforcement) or also includes aspects of avoidance (negative reinforcement) remains a topic of future study.

Effortful Control / Disinhibition

No specific hypotheses were made for relations of EC-D or related traits to any behavioral function. EC-D is nonetheless an important trait that has been shown to be relatively stable from 22 months onwards (Kochanska & Knaack, 2004). In fact, by age 4 in that sample, EC stability was equal to that of intelligence. Moreover, EC has been shown to be a developmentally meaningful construct linked to anger and approach systems (e.g., Adahi & Rothbart, 1994; Posner & Rothbart, 2000). Kochanska (1993) further identified effortful control as an active, effortful inhibitory system, in contrast to passive inhibition associated with traits such as fear.

In the current sample, CBQ inhibitory control yielded the strongest relation to clinician report of escape (r = -.36), and the negatively correlated trait of SNAP-ORF disinhibition yielded the strongest relation to percent problem behavior under escape conditions (r = .37) (Table 23). Taken together, these findings suggest that children higher (vs. lower) in EC-D were less (vs. more) likely to present with problem behavior maintained by escape. This finding is consistent with the concept of EC-D as related to conscientiousness and the ability to self-regulate. It also mirrors previous research showing that low EC is associated with externalizing behavior problems such as those seen in the clinics (e.g., Kochanska & Knaack, 2004; Olson et al., 2005; Olson, Schilling & Bates, 1999). Finally, it is theoretically consistent with concepts of EC as the ability to suppress a dominant response in

favor of a subdominant response (see Kochanska & Knaack, 2004), which mirrors the clinical procedure for assessing escape functions; that is, by asking a child to choose work (subdominant response) in place of play tasks (dominant response).

Temperament and Function: General Implications

The positive relation between E/S-PA and attention function(s) has important theoretical implications for the field of personality and temperament. Personality has long been defined as having motivational components, though in the past 'motivation' has been assessed primarily by its inclusion in items in self-report measures of personality or by stand-alone measures of motivations (such as the Assessment of Individual Motives Questionnaire; Bernard et al., 2008).

Although the relations between attention function(s) and E/S-PA were relatively consistent, the nature of these relations remains unclear. High E/S-PA could act as a setting event, that is, one of a broad range of variables that "sets the stage" for future behavioral responses (see Bijou & Baer, 1961; Leigland, 1984). Setting events typically operate independently from functional properties of behavior. In this case, high E/S-PA existing prior to any behavioral problems may serve to facilitate the development of behavior maintained by attention. E/S-PA also may serve to moderate the effect of an establishing operation that changes the reinforcing properties of attention (e.g., by making attention more or less reinforcing for certain individuals under certain conditions; see Michael, 1982). For example, a child high in extraversion who is left alone prior to assessment might be more likely to demonstrate problem behavior maintained by attention. In contrast, a child low in extraversion may show no change in attention-maintained problem

behaviors whether or not he/she is left alone prior to assessments. None of these hypotheses has been tested empirically.

The previous two hypotheses rely on the assumption that the personality trait exists temporally before the problem behavior. However, if researchers who conceptualize personality as a pattern of historically reinforced (or punished) behavior sets (Skinner, 1953) are correct, then this assumption is not valid. Further, the current study relied on parent-report measures of personality. Other-report measures like the CBQ and the SNAP-ORF necessarily rely on either observable behaviors or inference of unobservable phenomena such as thoughts or emotions based on those behaviors. Thus, a parent observing an attention function feasibly could report associated personality traits (including inferred, unobservable, internal phenomena) drawing on a limited number of observations, regardless of whether the full trait was actually present. For example, it would not be a far leap to report high exhibitionism—a trait characterized by problematic, excessive attention-seeking—if such behavior is observed, particularly if that behavior previously had been observed and targeted for treatment by a clinician. In the current study, parents typically filled out temperament measures subsequent to clinical appointments at which this feedback may be delivered. In this case, whether the function or the reported trait was established first to the reporter (parent) would be unclear.

In some cases, traits and functions also may be inseparable by time or definition. For example, dependency is defined by persistent behavior occurring to maintain affiliative relationships (function); the trait is by definition absent if this function is not observed (Bornstein, 1993). A similar situation exists for

exhibitionism, which is defined by attention-seeking. Thus, despite differences between the fields, in some cases personality and behavior analysis assess very similar constructs.

Moreover, although personality traits are defined in part by behavior, they also include a number of other components such as motivations, emotions, and thoughts. Use of self-report measures in addition to other-report measures could clarify whether the full range of associated, trait-relevant events (i.e., thoughts/ emotions/ motivations) were also present. If so, this would provide further evidence that the function of a given behavior is trait-related. Self-report measures were not used in the current study primarily because many of the children tested were expected to have limited reading skills, either due to age, learning disabilities, or developmental delays, and assessing children's traits through other methods (e.g., Eder, 1990) is very time consuming. Although problem behaviors requiring functional analysis are more common in children with these delays (Crnic et al., 2004), some of the children tested may have been able to self-report using verbally presented items or "either-or" measures comparing themselves to other children (Dadds & McAloon, 2004). Thus, a more extensive research project incorporating self- as well as other-assessment of personality might be able to shed light on relations between traits and function.

Historically, an important controversy in personality psychology was the well-known "person-situation debate." Essentially, this debate concerns whether traits "exist" and are meaningful ways of describing and predicting individuals' behavior (the "person" side) or whether they exist only as a descriptive summary of

a set of reactions to stimuli, such that the environment exerts the majority of control over behavior (see Kenrick & Funder, 1988 for a review). The current study provides evidence for an interaction between the person and the situation, which is consistent with the generally accepted interaction compromise that exists in modern personality theory (e.g., Magnusson & Endler, 1977; Mischel & Peake, 1983) and which most, if not all, trait psychologists maintain is actually subsumed within the trait (i.e., person) position (e.g., Kenrick & Funder, 1988; Fleeson, 2004). That is, these results support the existence of significant relations between traits and behavior in specific contexts, showing that particular traits (e.g., E/S-PA) more often co-occur with specific behavioral problems (in this case, attention function(s)). Also important is that the majority of evidence in this debate concerned consistency of forms of behavior over time and across situations, and was not at all concerned with function. As such, exploration of relations between traits and behavioral function is an innovative expansion on previous research.

Only recently have researchers begun to investigate pathological traits in childhood (e.g., De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006), and their assessment in clinical settings remains rare, perhaps because Axis II diagnoses are typically not diagnosed prior to age 18 (APA, 2004). In fact, the SNAP-ORF had to be modified specifically for use with children, as an alternative appropriate measure was not available (the youth version of the SNAP has been tested on children only as young as 11 years of age [Linde, Stringer, Simms, & Clark, 2012]). The current results show that pathological personality traits demonstrate acceptable range, reliability, and distribution in a sample of children aged 2-10 (Table 5).

Pathological traits also demonstrated acceptable convergent and discriminant validity within trait clusters, and related in anticipated ways to normal-range traits as measured by the CBQ (Table 8). Finally, pathological traits also provided the highest correlations with functional behavior problems for the majority of functions, and particularly with respect to traits associated with E/S-PA. These findings suggest that pathological personality traits are meaningful indices of individual differences with clinical relevance even in very young children. Future research could address whether these findings are stable over time, or whether either behaviors or traits are perceived as changing relative to one another.

Temperament and Function: Treatment Implications

Results linking behavioral function to personality also has important implications for treatment. As was noted previously, many current treatment models, such as ACT, CBT, DBT, and MBCT, rely heavily on identifying the reasons why an individual engages in dysfunctional behavior, then changing the reinforcing properties of that outcome, introducing alternative behaviors to achieve the desired outcome, or both. Thus, function is an important component in the treatment of personality pathology. Moreover, in a special section in the *Journal of Clinical Child and Adolescent Psychology*, Frick (2004) specifically indicated that identifying the effects of temperament on psychopathology—and even more specifically, mediation and/or moderation models for temperament and the environment—were of critical import to the field.

Although this procedure works well for children—for whom reinforcers and learning history are more limited—it is difficult to apply in the case of adults with

mental illness. The clinical analog conditions that provide a complete context for normally developing adults are not easily replicable in the clinic (Singh et al., 2006). An alternative to direct observation is the use of self-report measures to assess motivations for problem behaviors, such as the Questions About Behavioral Function (QABF; Matson & Vollmer, 1995). Although this measure was designed originally for use with a developmentally disabled population, and shows strong psychometrics in that population (Matson et al., 1996; Matson, Baumburg, Cherry & Paclawskyj, 1999; Paclawskyj, Matson, Rush, Smalls & Vollmer, 2000, 2001), it was adapted successfully to assess function in a broader mentally ill population (Singh et al., 2006). Importantly, Matson and colleagues (1999) also showed that treatments based on QABF-identified functions were more effective than treatments blind to the QABF, providing evidence that self-report data linked to function has clinical utility. Future research should address more fully relations between personality and self- or other-reports of function using these checklists as well as behavior observations and clinical data.

Measures such as the QABF easily could be adapted to address functions common to personality pathology, or could be combined with brief measures of personality as part of clinical assessment. After adapting the QABF for a general mentally ill population, Singh and colleagues (2006) specifically noted that use of functional measures "should be paired with personality and other assessments" to provide a more complete functional picture for treatment (p. 749). The current data show that the best predictors of behaviors maintained by attention were lower order (specific trait-level) measures of positive affectivity. E/S-PA traits generally are

well established as visible with high agreement between self- and other-ratings (Funder & Dobroth, 1987), and practicing clinicians rate lower order traits as more clinically useful than broader trait domains (Sprock, 2002). Based on this study's data, observing the presence of specific E/S-PA traits provides an important clinical clue that attention may be a function-maintaining problematic behavior, thus directing treatment to that function.

Costa and McCrae (1992) suggested that one reason clinicians do not regularly include personality measures as part of clinical assessment prior to or during intervention is that it is unclear how to use the results such measures in formulating treatment. The current study provides an important first step in providing a link between personality traits and behavioral treatment, which needs better explication in future research, for example, by assessing whether treatments targeting attention are more or less effective in children high/low in E/S-PA.

Temperament and Behavioral Form

Because the majority of temperament research emphasizes links with observable behavioral forms, a subsidiary goal of the current study was to replicate and extend previous findings documenting these links. Results show differentiation of behavioral topography by temperament for four of the eight categories of behavior coded: aggression, self-injurious behavior (SIB), tantrum, and verbal outbursts. No significant relations were found between any temperament variable and noncompliance, elopement, and destruction. Although approach/ positive anticipation was associated positively with the "other" category of problem behavior, this category was only defined as "any behavior not fitting into any other

category." Thus, it is unclear why these behaviors—which were not theoretically cohesive—would have a meaningful relation with any temperament variable. Future research could better explicate what behaviors fell into this category, and whether those behaviors rightfully should comprise an additional category of problem behavior not previously identified, or whether further subcategorization of this behavior set might prove useful.

Predictably, results showed that trait self-harm was significantly related to SIB, as was trait aggression with aggressive problem behavior. Aggressive behavior also was correlated negatively with soothability, low-intensity pleasure, and EC-D (r= -.29 with both sum and EFA CBQ EC, and .30 with SNAP disinhibition). The finding that EC-D is related negatively to aggressive behavior is consistent with previous research showing negative relations between FFM conscientiousness and aggression (e.g., Sharpe & Desai, 2001; but see Bartlett & Anderson, 2012). Negative relations between aggressive behavior and both soothability and low-intensity pleasure have not been documented previously, but appear theoretically consistent with the definition of these traits as low distress combined with easy distress recovery.

In contrast, tantrums were associated positively with manipulativeness suggesting that either highly manipulative children are more likely to engage in tantrums or parents view tantrums as more manipulative than other problem behaviors. Dependency, on the other hand, was associated negatively with tantrums and verbal outbursts. This finding is broadly consistent with previous findings in our lab showing that dependency is characterized more frequently by other-directed,

agreeable behaviors that clearly would preclude tantrums and verbal outbursts (Morgan & Clark, 2008). By extension, it is unclear why dependency would not also be associated negatively with all other problem behaviors, which are presumably equally, if not more, disagreeable and socially punished than tantrums and verbal outbursts. One possibility is that dependent children have learned that these two behaviors are specifically negative perceived by those they seek to dependent upon, whereas other problem behaviors are not or are less so.

Very little research has been conducted on manipulativeness in a child sample, other than as a subtrait of emerging psychopathy typically assessed in adolescence (e.g., Roose et al., 2012). As typically defined, manipulativeness is, at least in part, an "intentional" trait, which in its maladaptive form requires awareness of rules in order to bend or break those rules (see Table 3). However, in the current context it is unclear whether manipulativeness is actually present (i.e., with "intent" and awareness of rules) or whether it is perceived on the part of the parent. Another possibility is that manipulativeness is an emergent trait—one that develops over time in individuals whose behaviors, perhaps initially unwittingly, evoke responses from others that are positively reinforcing. The intentionality of manipulativeness then may emerge as such children develop cognitively and come to understand the relation between their behavior and the pursuant, reinforcing outcomes. Future research could address more fully the issue of intent in children who tantrum in comparison to other problem behaviors, such as aggression or SIB to better determine the specificity—or lack thereof—of manipulativeness to tantrum behavior.

Study Limitations

The current study had several limitations, most notably the relatively small sample size that likely limited the power of SEM and path-analysis models. A larger sample size would improve the ability of these methods to yield more definitive results. The sample also was characterized heavily by a single diagnosis (DBD), and was insufficiently disparate with regard to other diagnoses to permit comparisons across diagnostic groups. Future research should assess temperament and function across diagnostic groups, to determine whether the current findings generalize to all diagnoses.

Also important is that the current study was designed primarily to assess effectiveness (the utility/fit of a model under usual clinical conditions) rather than efficacy (the utility/fit of a model under 'ideal' or tightly controlled experimental conditions). Because no previous research has assessed relations between personality and behavioral function, the study also used an exploratory design. Thus, many variables were included naturalistically and were not controlled or selected for, such as diagnosis, children's age, exact clinical assessment methods, reporter (mother vs. father), or number of clinicians conducting the assessment. Subtleties of the behavior assessments such as stimulus control or additional establishing operation manipulations conducted within sessions also were not coded. Future research should address these concerns by testing results from this study under more tightly controlled conditions across a wide variety of demographic and clinical variables.

Finally, participants were not reimbursed for participation in this study. Although the clinics did receive a small amount of surplus funding for purchase of clinic materials, this amount was not promised prior to agreeing to participate, was made available only mid-way through recruitment, and did not seem to have an effect on recruitment activity. Nonetheless, recruitment was notable for a high number of parents who were difficult to contact (e.g., had inactive telephone numbers) and thus could not provide consent to participate, or who agreed to participate but did not return study materials. Thus, it is possible that the sample is biased to include parents who are more motivated, conscientious, or otherwise distinguished from the broader sample who were eligible to participate but could not be reached, or who were invited to participate but actively or passively chose not to do so. Methods that decreased the inconvenience/time constraints on parents (e.g., allowing parents to complete measures while at the clinic), or permitting a small amount of compensation as an inducement for participation might provide a somewhat more representative sample.

Study Strengths

The study also had several strengths. Importantly, there are no previously published studies that address relations between temperament/ personality variables and functional behavior problems. Thus, results from this study provide fertile ground for future research and hypothesis generation in both fields and, as previously noted, have broad implications for how function and temperament variables are conceptualized (e.g., as discrete or overlapping variables), for clinical treatment in various modalities, and for better understanding person-by-situation

interactions. Importantly, multiple measures of personality/temperament and function were included, allowing the study to address consistency of results across more than one measure. Finally, although not without drawbacks, the naturalistic design allowed for assessment of relations among a broad range of variables as they occurred organically, rather than only under strictly controlled experimental conditions, providing an important first step in understanding the fundamental interplay between the individual and the environment.

APPENDIX: TABLES AND FIGURES

Table 1. Psychiatric and Medical Diagnosis of 53 Children Aged 2-10.

Diagnosis	*N*	%
Psychiatric		
Disruptive Behavior Disorder	50	94.3
Language Disorder[1]	13	32.5
Pervasive Developmental Disorder NOS	10	18.9
Attention-Deficit/Hyperactivity Disorder	10	18.9
Mental Retardation	8	15.1
Autistic Disorder	5	9.4
Learning Disability	5	9.4
Mood/Anxiety Disorder[2]	5	9.4
Other Psychiatric Disorder[3]	16	30.2
Medical		
Hearing/Vision Impairment	8	15.1
Genetic Disorder[4]	7	13.2
Other Medical Disorder[5]	33	62.3

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Only diagnoses present for $\geq$ 5 participants are shown. Individuals could have more than one diagnosis.
[1]Such as Mixed Expressive-Receptive Language Disorder
[2]Such as Obsessive-Compulsive Disorder, Separation Anxiety Disorder
[3]Such as Oppositional Defiant Disorder, Conduct Disorder
[4]Such as Down Syndrome, CHARGE Syndrome
[5]Including any medical diagnosis other than hearing/vision impairment or genetic disorder.

Table 2. Scale and Factor Definitions from the Children's Behavior Questionnaire (CBQ) Short-Form.

Scale/Factor	Description
Factor 1 – Surgency	Averaged scale scores for: Activity Level, High-intensity Pleasure, Impulsivity, and Shyness*
Activity Level	Level of gross motor activity including rate and extent of locomotion
High Intensity Pleasure	Amount of pleasure or enjoyment related to situations involving high stimulus intensity, rate, complexity, novelty and incongruity
Impulsivity	Speed of response initiation
Shyness*	Slow or inhibited approach in situations involving novelty or uncertainty
Factor 2 – Negative Affectivity	Averaged scale scores for: Anger/Frustration, Discomfort, Fear, Sadness, and Soothability*
Anger/Frustration	Amount of negative affect related to interruption of ongoing tasks or goal blocking
Discomfort	Amount of negative affect related to sensory qualities of stimulation, including intensity, rate or complexity of light, movement, sound, texture
Fear	Amount of negative affect, including unease, worry, or nervousness related to anticipated pain or distress and/or potentially threatening situations
Sadness	Amount of negative affect and lowered mood and energy related to exposure to suffering, disappointment and object loss
Soothability*	Rate of recovery from peak distress, excitement, or general arousal
Factor 3 – Effortful Control	Averaged scale scores for: Attentional Focusing, Inhibitory Control, Low-intensity Pleasure, and Perceptual Sensitivity
Attentional Focusing	Tendency to maintain attentional focus upon task-related channels

Table 2. Continued.

Inhibitory Control	The capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations
Low Intensity Pleasure	Amount of pleasure or enjoyment related to situations involving low stimulus intensity, rate, complexity, novelty and incongruity
Perceptual Sensitivity	Detection of slight, low-intensity stimuli from the external environment
Additional Scales (not included in factor definitions)	
Approach/Positive Anticipation	Amount of excitement and positive anticipation for expected pleasurable activities
Smiling and Laughter	Amount of positive affect in response to changes in stimulus intensity, rate, complexity, and incongruity

Note. * Indicates scale is reverse-keyed when included in factor scores. Adapted from descriptions of the CBQ (Putnam & Rothbart, 2006).

Table 3. Scale and Factor Definitions from the Schedule for Nonadaptive and Adaptive Personality Other-Report Form (SNAP-ORF).

Scale	Description
Negative Temperament	Tendency to experience negative emotional states such as anxiety, stress, irritability, and anger.
Mistrust	Tendency to be suspicious of others, feel taken advantage of by others, and keep emotional distance from others
Manipulativeness	Tendency to take advantage of others and/or bend the rules with little regard for rights and feelings of others
Aggression	Tendency towards being easily angered and engage in verbal and physical conflicts
Self-harm	Tendency towards low self-esteem, physically hurting oneself when frustrated, and talk about or engage in suicidal behavior
Eccentric Perceptions	Tendency to believe in unusual abilities (e.g., ESP); may also report experiencing depersonalization/derealization
Dependency	Tendency to rely on others for direction, approval, and decision making
Positive Temperament	Tendency to experience high energy, enjoyment enthusiasm, optimism and cheerfulness.
Exhibitionism	Tendency to enjoy attention from others and to actively seek out such attention (e.g., via dress, speech, or behavior)
Entitlement	Tendency to view oneself as having enviable qualities deserving of recognition and privileges from others
Detachment	Tendency to remain aloof, distant, and detached from others. Report few strong emotions at all.
Disinhibition	Tendency towards disorganization and spontaneous action without regard for consequences (e.g., risks, breaking legal or social norms, failure to honor commitments)
Impulsivity	Tendency to live ‘moment-to-moment’ without future plans
Propriety	Tendency to value reputation and rely on proper standards of conduct/social convention.
Workaholism	Tendency towards perfectionism and enjoying work over play activities

Table 3. Continued.

Note. * Indicates scale is reverse-keyed when included in factor scores. Scale descriptions adapted from the SNAP-2 Manual (Clark, 1993) and description of the SNAP-ORF (Harlan & Clark, 1999).

Table 4. Description of Common Treatment Recommendations Made Subsequent to Clinical Behavior Assessment.

Treatment recommendation	Target function(s) (if clearly applicable)	Description
Attention/praise	A	Positive attention for desired behavior (social reinforcement). Frequently a component of other treatment recommendations such as FCT or PPac
Structured time		
Work/Play schedule		Schedule (visual or verbal) alternating high-preferred ("play") and low preferred ("work") activities; can be time or performance based
Picture Schedule		Visual schedule with pictures of activities to occur during a set period of time
Other structure		Any other reference(s) to increasing visual or verbal structure to activities
Outside referral/consults		
Diagnostic/medical consultation		Referral for diagnosis (psychiatric, medical, or genetic testing)
Area Educational Association (AEA)		Referral to access school-based services from the local AEA
Neuropsychological Evaluation		Referral for neuropsychological testing
Day Treatment Clinic		Referral for additional behavior analysis or treatment at the day-treatment clinic
Functional Communication Training (FCT)		Teaching an appropriate communication skill (verbal or nonverbal) to replace the identified function of problem behavior
FCT for attention	A	e.g., Teaching "say 'help please'" for attention
FCT for escape	E	e.g., Teaching "point to the 'break' card" to escape demands
FCT for tangibles	T	e.g., Teaching "push the button" to get access to toys

Table 4. Continued

Social interventions		Any intervention designed to improve social skills, such as peer-buddy groups, adult mentors, or scheduled playtimes with other children
Coordinate Care w/ schools or daycare		Coordinate recommendations with other settings
Positive Package for behavior change (PPac)		Differential reinforcement of compliance behavior that can be modified to address any of the 3 functions below:
PPac for attention	A	If specifically identified using the PPac for attention
PPac for escape	E	If specifically identified using the PPac for escape
PPac for tangibles	T	If specifically identified using the PPac for tangibles
Treasure Chest	A,T	A “treasure chest” of high-preferred toys is made available only at designated times (e.g.,, when attention is not available)
Neutral Blocking		Blocking aggression or self-injurious behavior without delivering attention or other potential reinforcers
Family Therapy		Any reference to family treatment (e.g., Parent-Child interaction therapy)
Calendar Time		Scheduled time with the child (e.g., one-on-one time with the parent, child selected activities), or other efforts to schedule time as family (e.g., at a family meeting)
Time Out	A,T	Removal of attention, access to tangibles, or other activities for a designated period of time after an occurrence of problem behavior
Delay to reinforcement		Building in a time delay before any reinforcer (e.g., attention, escape/breaks, tangibles) is delivered

Table 4. Continued.

Other treatment recommendation	Any treatment recommendation not falling into the above categories

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Individuals typically had more than one treatment recommendation (mean=5.8, SD=1.8, range=3-11). A= attention, E=escape, T=tangible.

Table 5. Descriptive Statistics for Personality Scales.

Scale Name	Mean	SD	min	max	k	alpha	AIC
SNAP-ORF							
Negative Temperament	4.44	1.11	1.67	6.00	3	.78	.54
Mistrust	2.41	1.01	1.00	5.50	2	.68	.52
Manipulativeness	3.55	1.18	1.33	6.00	3	.73	.47
Aggression	4.14	1.35	1.50	6.00	2	.68	.51
Self-harm	2.18	.96	1.00	6.00	2	.44	.28
Eccentric Perceptions	3.15	1.34	1.00	6.00	1	---	---
Dependency	3.68	1.31	1.00	6.00	2	.68	.51
Positive Temperament	4.73	1.14	2.50	6.00	2	.83	.71
Exhibitionism	3.76	1.51	1.00	6.00	2	.85	.74
Entitlement	2.93	1.20	1.00	6.00	2	.70	.54
Detachment[1]	2.72	1.24	1.00	5.00	3	.78	.54
Disinhibition	4.78	.96	2.00	6.00	3	.77	.52
Impulsivity	4.42	1.12	1.00	6.00	2	.74	.59
Propriety[1]	2.44	1.03	1.00	5.00	2	.71	.55
Workaholism[1]	2.30	.93	1.00	5.00	2	.60	.43
CBQ							
Surgency	4.79	.89	2.52	6.72	4	.72	.39
Activity Level	5.10	1.00	2.71	6.71	7	.77	.32
High Intensity Pleasure	4.96	1.31	1.50	7.00	6	.85	.49
Impulsivity	4.70	1.09	1.00	7.00	6	.70	.28
Shyness[1]	3.61	1.44	1.00	6.83	6	.84	.47
Negative Affectivity	4.45	.69	2.91	6.57	5	.71	.33
Anger/Frustration	5.52	.78	4.17	7.00	6	.66	.24
Discomfort	4.41	1.16	1.67	7.00	6	.73	.31
Fear	4.01	1.15	1.67	6.83	6	.74	.32
Sadness	4.57	.94	2.43	6.57	7	.67	.22

Table 5. Continued

Soothability[1]	3.67	1.03	1.83	5.67	6	.69	.27
Effortful Control	4.23	.67	2.31	5.42	4	.54	.23
Attentional Focusing	3.71	1.32	1.00	6.00	6	.85	.49
Inhibitory Control	3.22	.80	1.21	5.00	6	.52	.15
Low Intensity Pleasure	5.31	1.01	2.25	7.00	8	.78	.31
Perceptual Sensitivity	4.69	1.01	2.50	7.00	6	.68	.26
Additional Scales							
Approach/Positive Anticipation	5.10	1.09	2.17	7.00	6	.75	.33
Smiling and Laughter	5.18	.98	3.33	6.83	6	.70	.28

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Standardized alpha was computed for all scales where $k \geq 2$.
[1]Indicates scale is reverse-keyed when included in factor scores.

Table 6. Correlations Among Scales of the Children's Behavior Questionnaire (CBQ).

Scale Name	1	2	3	4	5	6	7	8	9
1. Surgency									
2. Activity Level	.65*								
3. High Intensity Pleasure	.78*	.47*							
4. Impulsivity	.82*	.52*	.46*						
5. Shyness*	-.70*	-.09	-.34	-.48*					
6. Negative Affectivity	-.32	-.02	-.22	-.26	.38*				
7. Anger/Frustration	.12	.21	.09	.11	.02	.56*			
8. Discomfort	-.23	.11	-.33	-.16	.22	.77*	.24		
9. Fear	-.55*	-.22	-.42*	-.37*	.55*	.72*	.26	.50*	
10. Sadness	-.15	-.03	-.07	-.08	.22	.71*	.26	.49*	.36*
11. Soothability[1]	.14	.07	-.10	.28	-.19	-.62*	-.31	-.29	-.21
12. Effortful Control	-.14	-.19	.11	-.28	.11	.15	-.23	.22	.19
13. Attentional Focusing	-.23	-.41*	-.05	-.32	.01	.09	-.26	.14	.14
14. Inhibitory Control	-.35*	-.21	-.15	-.32	.35	-.04	-.24	.05	.26
15. Low Intensity Pleasure	.26	.15	.41*	.07	-.11	-.07	-.17	.08	-.09
16. Perceptual Sensitivity	-.06	.05	.07	-.15	.13	.39*	.09	.28	.20
(Additional Scales)									
17. Approach/Positive Anticipation	.29	.40*	.33	.25	.03	.19	.18	.14	.20
18. Smiling and Laughter	.54*	.44*	.49*	.37*	-.31	-.14	.07	-.03	-.14

Table 6. Continued

Scale Name	10	11	12	13	14	15	16	17
1. Surgency								
2. Activity Level								
3. High Intensity Pleasure								
4. Impulsivity								
5. Shyness*								
6. Negative Affectivity								
7. Anger/Frustration								
8. Discomfort								
9. Fear								
10. Sadness								
11. Soothability[1]	-.32							
12. Effortful Control	.25	.00						
13. Attentional Focusing	.16	-.03	.68*					
14. Inhibitory Control	-.07	.22	.60*	.27				
15. Low Intensity Pleasure	.05	.14	.75*	.33	.23			
16. Perceptual Sensitivity	.47*	-.27	.56*	-.04	.21	.39*		
(Additional Scales)								
17. Approach/Positive Anticipation	.13	-.00	.21	-.09	.14	.35*	.22	
18. Smiling and Laughter	-.10	.23	.18	.01	-.04	.49*	-.00	.34

Note. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. * $p \leq .01$. [1] Indicates scale is reverse-keyed when included in factor scores.

Table 7. Correlations Among Scales of the Schedule for Nonadaptive and Adaptive Personality, Other-Report Form (SNAP-ORF).

Scale Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Negative Temperament														
2. Mistrust	.51*													
3. Manipulativeness	.29	.07												
4. Aggression	.42*	.33	.51*											
5. Self-harm	.33	.46*	.27	.23										
6. Eccentric Perceptions	.04	-.02	.01	.17	-.04									
7. Dependency	.08	.12	-.28	-.21	.19	.14								
8. Positive Temperament	-.26	-.24	.18	.11	-.36*	.07	-.23							
9. Exhibitionism	.02	-.25	.42*	.24	-.06	-.13	.18	.39*						
10. Entitlement	.13	.05	.48*	.42*	.10	.04	-.12	.51*	.45					
11. Detachment[1]	.19	.41*	.03	.01	.32	.08	-.10	-.44*	-.59*	-.34				
12. Disinhibition	.20	.04	.17	.45*	-.08	.22	-.08	.03	.28	.24	-.13			
13. Impulsivity	-.02	-.38*	.23	.18	-.23	.33	.02	.30	.33	.35*	-.22	.45*		
14. Propriety[1]	-.22	-.12	-.41*	-.28	.06	-.25	.34	-.16	.01	-.20	-.05	-.25	-.26	
15. Workaholism[1]	.03	.13	-.12	-.06	.07	-.32	.20	.05	.19	.11	-.27	-.31	-.23	.39*

Note. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. * $p \leq .01$. [1]Indicates scale is reverse-keyed when included in factor scores.

Table 8. Correlations Between the Schedule for Nonadaptive and Adaptive Personality Other-Report Form (SNAP-ORF) and the Children's Behavior Questionnaire (CBQ).

Scale Name	NT	MIS	MAN	AGG	SH	EP	DEP	PT	EXH	ENT	DET	DIS	IMP	PRO	WK
Surgency	-.10	-.32	.14	.09	-.21	-.05	-.17	**.60***	.38*	.35*	-.42*	.21	.47*	-.13	.02
Activity Level	-.02	-.05	.19	.19	-.21	-.08	-.12	**.75***	.28	.44*	-.29	.18	.26	-.12	-.03
High Intensity Pleas.	-.10	-.30	.29	.02	-.08	-.09	-.28	**.59***	.39*	.29	-.24	.14	.44*	-.25	-.06
Impulsivity	.03	-.21	.12	.15	-.17	.16	.03	.40*	.34	.29	-.38*	.24	**.47**	-.13	.03
Shyness*	.16	.31	.15	.03	.17	.12	.09	-.13	-.14	-.09	**.34**	-.09	-.23	-.09	-.09
Negative Affectivity	**.58***	.30	.18	.25	.25	-.02	.25	-.13	-.01	.11	.05	-.02	-.05	.10	.12
Anger/Frustration	**.51***	.17	.40*	.47*	.10	-.05	.00	.06	.18	.24	.04	.07	.16	-.11	.19
Discomfort	.24	.08	-.07	-.02	.04	-.10	**.37***	-.04	-.04	.01	-.13	-.15	-.09	.31	.17
Fear	**.36***	.27	.09	.15	.18	.13	.19	-.19	-.05	.05	.03	-.12	-.18	.18	.13
Sadness	**.51***	.24	.06	.12	.23	-.03	.22	-.08	.05	.17	.11	.06	.05	.05	.06
Soothability*	**-.42***	-.27	-.24	-.23	-.32	.03	.00	.17	.12	.02	-.16	-.11	.02	.17	.15
Effortful Control	-.18	-.10	.05	-.32	.06	-.31	-.04	.09	.15	.11	-.09	**-.36***	-.19	.10	.24
Attentional Focus	-.11	-.17	-.06	-.21	-.17	-.16	-.16	-.06	-.04	-.02	-.01	**-.22**	-.07	-.05	.14
Inhibitory Control	-.27	.01	.04	-.23	.11	-.10	-.11	-.00	-.07	-.10	.03	**-.55***	-.40*	.04	.12
Low Intensity Pleas.	-.30	-.32	.04	-.31	-.11	-.24	.01	.36*	**.37***	.27	-.31	-.16	.07	.11	.25
Perceptual Sens.	.17	.25	.14	-.08	**.40***	-.29	.19	-.04	.13	.13	.06	-.07	-.16	.19	.09
(Additional Scales)															
Approach/Pos. Antic.	.14	-.01	.29	.07	.12	-.13	.11	**.43***	.34	.38*	-.31	-.19	-.07	.06	.26
Smiling and Laughter	-.09	-.38*	.18	.04	-.34	.04	-.05	.58*	**.59***	.28	-.53*	.17	.28	-.07	-.00
CBQ Exploratory Factor Analysis															
(EFA) Surgency	-.13	-.33	.22	-.02	-.18	-.15	-.10	**.73***	.54*	.48*	-.47*	.08	.36*	-.03	.15
(EFA) Negative Affect	**.47***	.35	.16	.13	.32	-.08	.27	-.13	-.03	.13	.10	-.12	-.19	.17	.13
(EFA) Effortful Control	-.29	-.08	-.13	-.41*	.03	-.16	.02	-.19	-.06	-.16	.05	**-.43**	-.36	.16	.22

Table 8. Continued.

Note N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics..* $p \leq .01$. Highest correlation per row appears in boldface, per column is underlined. NT=Negative Temperament; MIS=Mistrust; MAN=Manipulativeness; AGG=Aggression; SH=Self-harm; EP=Eccentric Perceptions; DEP=Dependency; PT=Positive Temperament; EXH=Exhibitionism; ENT=Entitlement; DET=Detachment; DIS=Disinhibition; IMP=Impulsivity; PRO=Propriety; WK=Workaholism

Table 9. Exploratory Factor Analytic Results for the Children's Behavior Questionnaire (CBQ).

Scale	Factor 1 (Surgency)	Factor 2 (Negative Temperament)	Factor3 (Effortful Control)
High Intensity Pleasure	**.73**	-.14	-.10
Low Intensity Pleasure	**.70**	.04	.55
Smiling and Laughter	**.68**	-.09	.07
Activity Level	**.60**	.13	**-.42**
Approach/Positive Motivation	**.56**	.32	.02
Impulsivity	**.49**	-.22	**-.40**
Discomfort	.04	**.71**	.04
Sadness	.08	**.67**	-.07
Fear	-.20	**.66**	.12
Perceptual Sensitivity	.31	**.54**	.16
Shyness	-.30	**.44**	.16
Soothability	.11	**-.53**	.28
Inhibitory Control	.01	.03	**.63**
Attentional Focusing	-.01	-.03	**.61**
Anger/Frustration	.08	**.46**	**-.48**

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Loadings $\geq$ .40 appear in boldface.

Table 10. Behavioral Topography (Form) for 53 Children Aged 2-10.

Behavioral topography	*N*	%
Any Aggression	39	73.6
Hitting	26	49.1
Kicking	11	20.1
Biting	9	17.0
Pushing/Shoving	6	11.3
Scratching	3	5.7
Spitting	4	7.6
Other Aggression	13	24.5
Any Self Injury	15	28.3
Head banging	9	17.0
Hitting	6	11.3
Biting	5	9.3
Other Self Injury	6	11.3
Tantrum	32	60.4
Verbal Outbursts	17	32.1
Noncompliance	31	58.5
Destruction	24	45.3
Elopement	4	7.6
Other	20	37.8

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Individuals could have more than one topography. See text for verbal descriptions of behavior forms.

Table 11. Type of Analysis Conducted in the Clinic for 53 Children Aged 2-10.

Analysis	*N*	%
Brief Functional Analysis	32	60.4
Antecedent Analysis	7	13.2
Choice Assessment	6	11.3
Behavioral Treatment	6	11.3
Other	2	3.8

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics.

Table 12. Behavioral Function by Clinician Report of 53 Children Aged 2-10.

Function	absent (0)		suspected (1)		present (2)	
	N	*%*	*N*	*%*	*N*	*%*
Attention	32	60.4	7	13.2	14	26.4
Escape (from demands)	36	67.9	4	7.6	13	24.5
(access to) Tangible	46	86.8	3	5.7	4	7.6
Automatic	51	96.2	1	1.9	1	1.9
Other	51	96.2	0	0.0	2	3.8

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. "Absent" indicates the function is not present by clinician report; "Suspected" indicates the clinician report clearly states the function is present but behavior was not observed under test conditions in the clinic; "Present" indicates clinician report clearly states the function is present and problem behavior was observed under test conditions in the clinic.

Table 13. Treatment Recommendations Made Subsequent to Clinical Behavior Assessment for 53 Children Aged 2-10.

Treatment recommendation	*N*	%
Attention/praise	53	100.0
Structured time	31	58.5
Work/Play schedule	18	34.0
Picture Schedule	14	26.4
Other structure	16	30.2
Outside referral/consult	24	45.3
Diagnostic/medical consultation	17	32.1
Area Educational Association	5	9.4
Neuropsychological Evaluation	5	9.4
Day Treatment Clinic	3	5.7
FCT	23	43.4
FCT for attention	7	13.2
FCT for escape	9	17.0
FCT for tangible	13	24.5
Social interventions	14	26.4
Coordinate Care w/ schools or daycare	11	20.1
Positive Package for behavior change (PPac)	9	16.7
PPac for attention	2	3.8
PPac for escape	7	13.2
PPac for tangible	0	0.0
Treasure Chest	9	17.0
Neutral Blocking	9	17.0
Family Therapy	6	11.3
Calendar Time	6	11.3
Time Out	5	9.4
Delay to reinforcement	3	5.7
Other treatment recommendation	8	15.1

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Individuals could have more than one treatment recommendation (mean=5.8, SD=1.8, range=3-11).

Table 14. Descriptive Statistics for Clinician Report of Function, Function-Specific Treatment Recommendations, Rate of Problem Behavior Under Test Conditions, Frequency and Severity of Problem Behavior.

Function	Mean	Std	*N*	min	max	range possible
Clinician Statement						
Attention	.66	.88	53	0	2	0-2
Escape	.57	.87	53	0	2	0-2
Tangible	.21	.57	53	0	2	0-2
Automatic	.06	.30	53	0	2	0-2
Other	.08	.38	53	0	2	0-2
Treatment Recommendations						
Attention	1.17	.38	53	1	2	0-2
Escape	.30	.54	53	0	2	0-2
Tangible	.25	.43	53	0	1	0-2
% Problem Behavior (Pb) observed in test sessions[1]						
Attention	18.97	28.05	32	0	95	0-100
Escape	18.63	24.55	35	0	90	0-100
Tangible	17.31	22.32	12	0	75	0-100
Automatic	5.41	14.37	34	0	70.0	0-100
Other	9.75	13.34	6	0	33.3	0-100
Frequency						
Average in clinic	15.27	15.79	53	0	61.67	0-100
Clinician rating	3.46	.96	37	1	5	1-5
Severity						
Sum of Pb types	4.74	2.32	41	1	11	1-11
Clinician rating	1.76	0.76	37	1	4	1-5

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. Treatment for automatic and 'other' functions was not specified in reports and so were excluded from these analyses.

[1]Includes only those individuals for whom a behavior test session assessing each specific function was conducted. Attention n = 32; Escape n = 35; Tangible n = 12; Automatic (defined as behavior occurring in alone or across FP conditions) n = 34; Other n = 6.

Table 15. Correlations Among Clinician Reports of Function, Function-Specific Treatment Recommendations, and Rate of Problem Behavior Under Test Conditions.

	CAtt	CEsc	CTan	CAut	COth	TAtt	TEsc	TTan	%Att	%Esc	%Tan	%Aut
Clinician												
Escape	.33*											
Tangible	-.13	-.09										
Automatic	-.14	-.12	.04									
Other	-.15	-.13	-.07	-.04								
Treatment												
Attention	**.41****	-.06	.10	-.08	-.09							
Escape	-.23	**.16**	-.08	-.11	.07	-.07						
Tangible	-.23	-.17	**.57***	.33*	-.11	-.02	.01					
% Problem Behavior												
Attention	**.37***	-.04	-.23	-.12	---	**.18**	-.17	-.28				
Escape	-.09	**.45****	-.12	-.18	---	-.02	**.33**	-.24	.36			
Tangible	-.41*	-.06	**.41***	-.20	-.30	-.52*	-.39*	**-.30**	.07	-.08		
Automatic	-.01	-.25	-.17	**.08**	---	.34*	-.07	-.14	.05	.02	.06	
Other	-.57	-.52	---	---	**.17**	---	-.08	---	---	---	---	---

Note. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. ** $p <$. 01; * $p <$. 05; C=Clinician, T=Treatment, %=% problem behavior observed under test conditions; Att=Attention, Esc=Escape, Tan=Tangible, Aut=Automatic, Oth=Other. --- indicates correlation could not be computed due to too few overlapping cases or invalid denominator values (0). Correlations for different measures of the same function appear in boldface. Treatment for automatic and 'other' functions was not specific in reports and so were excluded from these analyses. Correlation values necessary to achieve significance may vary for % problem behavior variables because not all patients underwent all test conditions (*N*s' from 6 to 53). *N*=53 for all other correlations.

Table 16. Mean Correlations Among Clinician Reports of Function, Function-Specific Treatment Recommendations, and Rate of Problem Behavior Under Test Conditions.

	Attention	Escape	Tangible	Automatic	Other
Attention	.32				
Escape	-.18	.31			
Tangible	-.00	-.14	.15		
Automatic	.01	-.12	-.01	.08	
Other	-.27	-.17	-.16	.07	.17

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics.

Table 17. Correlations Among Clinician-Rated and Treatment-Indicated Function, and Frequency and Severity of Problem Behavior.

Function	CAtt	CEsc	CTan	CAut	COth	TAtt	TEsc	TTan	F-IC	F-CLI	S-SPb
Frequency											
Average in clinic (F-IC)	.02	.16	-.02	-.12	-.04	-.04	.14	-.17			
Clinician rating (F-CLI)	.12	.06	.10	.27	---	.35*	.19	.22	.35		
Severity											
Sum of Pb types (S-SPb)	-.04	.08	.14	-.03	-.24	.12	.03	.12	.11	.15	
Clinician rating (S-CLI)	.02	-.09	.02	-.17	---	-.40*	-.04	.04	-.14	-.60**	-.16

Note. * $p \leq .01$; ** $p \leq .05$; C=Clinician, T=Treatment, %=% problem behavior observed under test conditions; Att=Attention, Esc=Escape, Tan=Tangible, Aut=Automatic, Oth=Other, F-IC=average frequency of problem behavior observed in the clinic; F-CLI= clinician rating of frequency; S-SPb= sum of problem behavior types listed as a presenting problem; S-CLI=clinician rating of severity. --- indicates correlation could not be computed due to too few overlapping cases or invalid denominator values (0). Correlations for different measures of the same function appear in boldface. Treatment for automatic and 'other' functions was not specific in reports and so were excluded from these analyses. Correlation values necessary to achieve significance may vary for % problem behavior and other clinician report variables because not all patients underwent all test conditions (*N*s' from 6 to 53). *N*=53 for all other correlations.

Table 18. Relations Between Behavior Topography (Form) and Temperament in 53 Children Aged 2-10.

Personality Scale	Agg.	SIB	Tantr.	Verb.	Non-comp	Destr.	Elope	Oth.	F-IC	F-CLI	S-SPb	S-CLI
SNAP-ORF												
Negative Temperament	.09	.16	.01	-.02	.24	-.07	-.20	.01	.19	-.10	.19	-.04
Mistrust	.02	.22	.02	.15	.19	.07	-.04	.08	.09	.16	.26	.06
Manipulativeness	.17	.14	.36**	.21	.12	.12	.15	.14	.07	-.13	.38**	.13
Aggression	**.44****	.18	.07	.27	.10	.04	.05	-.07	.10	-.19	.42**	.15
Self-harm	.25	**.31***	.22	.25	.09	.05	-.13	.14	-.11	.28	**.51****	-.08
Eccentric Perceptions	-.00	.05	-.00	.12	.07	.03	-.03	-.03	-.23	-.15	.01	-.12
Dependency	-.23	-.04	**-.43****	**-.27***	.26	.02	-.04	.05	.03	.33*	-.22	-.32
Positive Temperament	-.16	-.24	.11	.01	.03	.12	.10	.19	-.09	-.12	-.14	.05
Exhibitionism	-.05	-.06	.00	-.20	.11	.09	.07	.11	.09	.12	-.06	-.07
Entitlement	-.10	-.03	.04	.01	.11	-.19	-.12	.24	-.01	-.06	-.07	.03
Detachment	.07	.25	.15	.10	-.06	.07	.10	-.14	-.15	.07	.25	.07
Disinhibition	.30*	-.01	-.08	.08	-.05	-.00	.07	-.04	.14	.06	.10	-.10
Impulsivity	.06	-.06	-.16	-.18	-.00	-.20	.08	-.08	-.18	-.04	-.17	-.16
Propriety	-.04	.01	-.12	-.12	-.15	-.06	-.12	-.18	-.15	.28	-.13	**-.39***
Workaholism	-.05	-.19	-.10	.09	.24	-.06	.10	.04	-.12	-.17	-.06	-.00
CBQ												
Surgency	-.02	-.05	-.15	.01	.01	.09	-.03	.01	.11	-.08	-.08	.05
Activity Level	-.11	-.11	-.08	-.03	-.06	.07	-.06	.13	.08	-.13	-.14	.15
High Intensity Pleasure	.07	-.06	.15	-.04	.05	.22	.05	.13	.03	.04	.14	.02
Impulsivity	-.10	-.04	-.38**	.00	-.05	-.08	-.06	-.00	.03	-.24	-.24	.11
Shyness*	-.03	-.02	.17	-.04	-.05	-.04	.04	.18	-.22	-.09	.04	.11
Negative Affectivity	.05	-.01	.08	.01	**.27**	-.16	-.17	.08	.04	-.06	.11	-.31

Table 18. Continued.

Anger/Frustration	.19	.13	.04	.05	.16	-.00	-.05	-.08	**.30**	-.19	.24	-.26
Discomfort	-.09	-.20	-.12	-.07	.17	**-.24**	-.08	.00	-.19	-.03	-.21	-.19
Fear	-.10	-.05	.16	.09	.23	-.14	-.06	.06	.07	-.11	.01	-.17
Sadness	-.17	.01	-.01	-.21	.12	-.22	-.21	.17	-.14	.01	-.09	-.13
Soothability*	-.38**	-.13	-.21	-.18	-.20	-.09	.16	-.10	-.11	-.10	-.50**	.16
Effortful Control	-.29*	-.11	.14	-.10	.05	.05	-.01	.10	-.10	.18	-.15	.05
Attentional Focusing	-.09	-.20	-.03	.06	.10	-.00	.12	.06	-.06	-.14	-.11	.17
Inhibitory Control	-.20	.06	.23	.00	-.08	.11	.08	-.04	-.08	-.07	-.02	.17
Low Intensity Pleasure	-.41**	-.20	.09	-.21	.13	-.01	-.05	.11	.09	.28	-.32*	-.00
Perceptual Sensitivity	-.07	.10	.14	-.14	-.03	.09	**-.23**	.12	-.03	**.42****	.08	-.22
(Additional Scales)												
Approach/Positive Ant.	-.24	-.00	.11	-.03	.16	-.03	-.00	**.30***	.07	-.12	-.00	.05
Smiling and Laughter	-.21	-.11	-.04	-.20	-.07	.11	-.00	.17	.03	-.14	-.22	.16
CBQ Exploratory Factor Analysis												
(EFA) Surgency	-.16	-.12	-.01	-.15	.04	.09	-.05	.15	.02	.05	-.19	.06
(EFA) Negative Affect	-.05	-.02	.15	-.04	.20	-.13	-.17	.14	-.06	.08	.07	-.27
(EFA) Effortful Control	-.29*	-.11	.18	-.09	.03	-.00	.08	.04	-.16	.14	-.18	.08

Note. ** $p \leq .01$; * $p \leq .05$. Highest correlation in each column appears in boldface; highest correlation in each row is underlined. Agg=total aggression; SIB=total self-injurious behavior; Tantr.= tantrum; Verb.= total verbal outbursts; Non-comp.= noncompliance with requests/instructions; Destr.=destruction of property; Elope=elopement; oth.=any other problem behavior specifically identified as such in clinician reports but not falling into any of the preceding categories. F-IC=average frequency of problem behavior observed in the clinic; F-CLI= clinician rating of frequency; S-SPb= sum of problem behavior types listed as a presenting problem; S-CLI=clinician rating of severity. Correlation values necessary to achieve significance may vary for % problem behavior and other clinician report variables because not all patients underwent all test conditions (*N*s' from 6 to 53). *N*=53 for all other correlations.

Table 19. Zero-Order Correlations Between Temperament Scales and Function Variables.

Personality Scale	CAtt	CEsc	CTan	CAut	COth	TAtt	TEsc	TTan	%Att[1]	%Esc[1]	%Aut[1]
SNAP-ORF											
Negative Temp.	-.10	.26	-.20	-.25	.01	-.20	**.28***	-.32*	.03	.30	.06
Mistrust	-.27	-.10	-.13	.11	.07	-.16	.14	-.01	.00	.24	.16
Manipulative	.18	.11	-.34*	-.06	-.26	-.07	.05	-.29*	.20	.09	.21
Aggression	.00	.23	-.10	-.11	-.06	-.05	.02	-.14	.03	.34	-.02
Self-harm	-.04	.10	-.09	.09	-.04	-.17	.06	.03	.06	.05	-.22
Ecc. Percept.	.03	.08	.04	.11	.05	-.05	.08	.14	-.12	-.28	-.17
Dependency	-.02	-.07	.14	.17	.24	-.01	.07	-.01	-.00	.01	-.05
Positive Temp.	.33*	-.09	.02	-.32*	-.04	.22	-.05	-.15	.12	-.23	.18
Exhibition	**.44****	.14	-.04	-.22	-.17	.17	-.11	-.28*	.07	.00	.26
Entitlement	.29*	.12	-.19	-.17	-.11	.05	.07	-.32*	**.44***	.05	.00
Detachment	**-.45****	.03	.01	.28	-.06	**-.35***	.15	.29*	-.31	.10	-.19
Disinhibition	-.31*	.24	.09	-.15	-.16	-.14	.06	.07	-.11	**.37***	-.05
Impulsivity	.09	.12	.01	.10	.19	-.11	.08	-.02	-.21	-.21	-.05
Propriety	.07	.16	-.03	.01	.11	.18	-.07	-.11	-.12	.09	-.14
Workaholism	-.02	-.15	-.09	-.06	.15	.10	.00	-.28	.16	-.07	-.08
CBQ											
Surgency	.13	.03	.14	-.17	.07	-.06	.07	-.02	.04	-.03	.20
Activity Level	.21	.06	.09	-.25	.01	.03	.08	-.11	.13	.02	.13
High Int. Pleas.	.13	-.05	.08	-.26	.01	-.09	-.01	.01	.01	-.12	.19
Impulsivity	.10	.07	.00	.01	.16	-.15	.07	-.12	-.04	-.05	.22
Shyness	.02	-.02	-.21	.01	.16	-.04	-.07	-.10	-.04	-.07	-.07
Negative Affectivity	.02	.15	-.22	-.13	.05	.00	-.08	-.44**	.23	.14	-.18
Anger/Frustration	-.16	.11	-.11	.07	.10	-.09	.12	-.25	.22	.33	.18
Discomfort	.12	.03	-.06	-.06	.04	.15	-.05	-.29*	.14	-.16	-.30
Fear	.08	.15	**-.38***	-.12	.10	.05	-.09	**-.49****	.26	.21	-.15
Sadness	-.06	.19	-.08	-.11	.03	-.22	-.20	-.37**	.04	.07	**-.36***
Soothability	-.01	-.04	.08	.09	.11	-.06	.01	.06	-.04	-.04	-.06

Table 19. Continued

Effortful Control	.14	-.21	-.06	-.01	**-.31***	.16	-.23	-.15	.17	-.26	-.04
Attentional Focus	.12	-.02	-.14	-.04	-.21	.12	-.15	-.22	-.06	-.19	-.20
Inhibitory Control	-.06	**-.36**	-.03	.00	-.24	.13	-.22	-.01	.14	-.22	-.02
Low Int. Pleas.	.31*	-.15	-.00	-.07	-.11	.21	-.15	-.04	.27	-.28	.09
Perceptual Sens.	-.05	-.10	.06	.08	-.25	-.04	-.08	-.06	.18	.01	.09
(Additional Scales)											
Approach/Pos. Antic.	.28	-.08	-.23	-.19	-.02	.22	-.05	-.36**	.35*	.04	.08
Smiling and Laughter	.38**	.05	.09	**-.33***	-.12	.14	-.05	-.12	.06	-.15	.02
Exploratory Factor Analysis											
(EFA) Surgency	.29*	-.05	.07	-.24	-.03	.06	-.04	-.12	.18	-.14	.16
(EFA) Negative Affect	.04	.07	-.21	-.09	-.04	.04	-.12	-.39**	.25	.08	-.19
(EFA) Effortful Control	.09	-.21	-.10	.06	-.22	.19	-.23	-.04	.10	-.24	-.13

Note. ** $p < .01$; * $p < .05$. Highest correlation in each column appears in boldface; highest correlation in each row is underlined. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics for majority of correlations (exceptions noted below). Treatment for automatic and 'other' functions was not specific in reports and so were excluded from these analyses. C=Clinician, T=Treatment, %=% problem behavior observed under test conditions; Att=Attention, Esc=Escape, Tan=Tangible, Aut=Automatic, Oth=Other.

[1]Includes only those individuals for whom a behavior test session assessing each specific function was conducted. Attention *n* = 32; Escape *n* =35; Automatic (defined as behavior occurring in alone or across FP conditions) *n* =34. Sample size was insufficient to conduct analyses for Tangible (*n* =12) and Other (*n* =6) sessions.

Table 20. Fit Statistics for Structural Equation Models for Temperament and Function.

Model Description	χ^2	*p*	CFI	TLI	RMSEA	SRMR
SEM – E/S-PA and N-NA						
Clinician statement	9.19	.33	.98	.97	.05	.06
Treatment Recs.	12.46	.10	.91	.82	.11	.08
% Problem Behavior	10.68	.22	.95	.91	.08	.10
Path Analysis						
(1) Exhibitionism						
Clinician statement	1.06	.30	1.00	.99	.04	.05
Treatment Recs.	.66	.42	1.00	1.00	.00	.04
% Problem Behavior	.01	.94	1.00	1.00	.00	.00
(2) Entitlement						
Clinician statement	.77	.38	1.00	1.00	.00	.04
Treatment Recs.	.24	.62	1.00	1.00	.00	.02
% Problem Behavior	.08	.78	1.00	1.00	.00	.02
(3) Detachment						
Clinician statement	.04	.85	1.00	1.00	.00	.01
Treatment Recs.	1.18	.28	.96	.89	.06	.05
% Problem Behavior	.33	.57	1.00	1.00	.00	.04

Note. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. H_0 was retained for all χ^2 tests of significance. Figure 3 shows the model tested. Recs = Recommendations, CFI=Comparative Fit Index, TLI=Tucker-Lewis Index, RMSEA=Root Mean Square of Approximation, SRMR=Standardized Root Mean Residual.

Table 21. Parameter Estimates for Structural Modeling Results.

Model (Function)	PA→Attn	*p*	NA→Esc	*p*	NA→Attn	*p*	Attn ←→Esc	*p*
Clinician statement	.36**	.01	---	---	---	---	.35**	.00
Treatment Recs.	.14	.26	---	---	---	---	-.21	.28
% Problem Behavior	.25	.20	---	---	---	---	.39**	.01

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. $^{**}p \leq .01$; $^{*}p \leq .05$. --- indicates a nonsignificant parameter dropped from the model. Parameter estimates are standardized values. Recs = Recommendations, PA=Positive Affectivity, NA=Negative Affectivity, Attn=Attention, Esc=Escape.

Table 22. Parameter Estimates for Path Analysis Models for Temperament and Functioning.

Model (Function)	Trait→Attn	*p*	Attn ←→Esc	*p*
(1) SNAP-ORF Exhibitionism				
Clinician statement	.41**	.00	.28*	.02
Treatment Recs.	.17	.21	-.05	.72
% Problem Behavior	.07	.65	.36*	.02
(2) SNAP-ORF Entitlement				
Clinician statement	.26*	.04	.31*	.01
Treatment Recs.	.05	.71	-.07	.61
% Problem Behavior	.43**	.00	.31*	.04
(3) SNAP-ORF Detachment				
Clinician statement	-.46**	.00	.35**	.00
Treatment Recs.	-.34*	.02	-.02	.90
% Problem Behavior	-.35*	.02	.39**	.01

Note. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. $^{**}p \leq .01$; $^{*}p \leq .05$. Parameter estimates are standardized values. Recs = Recommendations, Attn=Attention, Esc=Escape.

Table 23. Highest Correlations Among Temperament Scales and Function Variables.

	Clinician				Treatment	Percent			Clinician	Treatment	
Personality Scale	CAtt	CEsc	CAut	COth	TTan	%Att[1]	%Esc[1]	%Aut[1]	CTan	TAtt	TEsc
SNAP-ORF											
Detachment	**-.45****	.03	.28	-.06	.29*	-.31	.10	-.19	.01	**-.35****	.15
Exhibitionism	**.44****	.14	-.22	-.17	-.28*	.07	.00	.26	-.04	.17	-.11
CBQ											
Inhibitory Control	-.06	**-.36****	.00	-.24	-.01	.14	-.22	-.02	-.03	.13	-.22
Smiling & Laughter	.38	.05	**-.33***	-.12	-.12	.06	-.15	.02	.09	.14	-.05
SNAP-ORF											
Positive Temperament	.33*	-.09	**-.32***	-.04	-.15	.12	-.23	.18	.02	.22	-.05
CBQ											
Effortful Control	.14	-.21	-.01	**-.31***	-.15	.17	-.26	-.04	-.06	.16	-.23
Fear	.08	.15	-.12	.10	**-.49****	.26	.21	-.15	**-.38***	.05	-.09
SNAP-ORF											
Entitlement	.29*	.12	-.17	-.11	-.32	**.44***	.05	.00	-.19	.05	.07
Disinhibition	-.31*	.24	-.15	-.16	.07	-.11	**.37***	-.05	.09	-.14	.06
CBQ											
Sadness	-.06	.09	-.11	.03	-.37	.04	.07	**-.36***	-.08	-.22	-.20
SNAP-ORF											
Negative Temperament	-.10	.26	-.25	.01	-.32	.03	.30	.06	-.20	-.20	**.28**

Note. *N*=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics (exceptions noted below). ** $p <$. 01; * $p <$. 05. Highest correlation per row appears in boldface. Treatments for automatic and 'other' functions were not specific in reports and so were excluded from these analyses. See table 19 for full correlation matrix. C=Clinician, T=Treatment, %=% problem behavior observed under test conditions; Att=Attention, Esc=Escape, Tan=Tangible, Aut=Automatic, Oth=Other.

[1]Includes only those individuals for whom a behavior test session assessing each specific function was conducted. Attention *n* = 32; Escape *n* =35; Automatic (defined as behavior occurring in alone or across FP conditions) *n* =34. Sample size was insufficient to conduct analyses for Tangible (*n* =12) and Other (*n* =6) sessions.

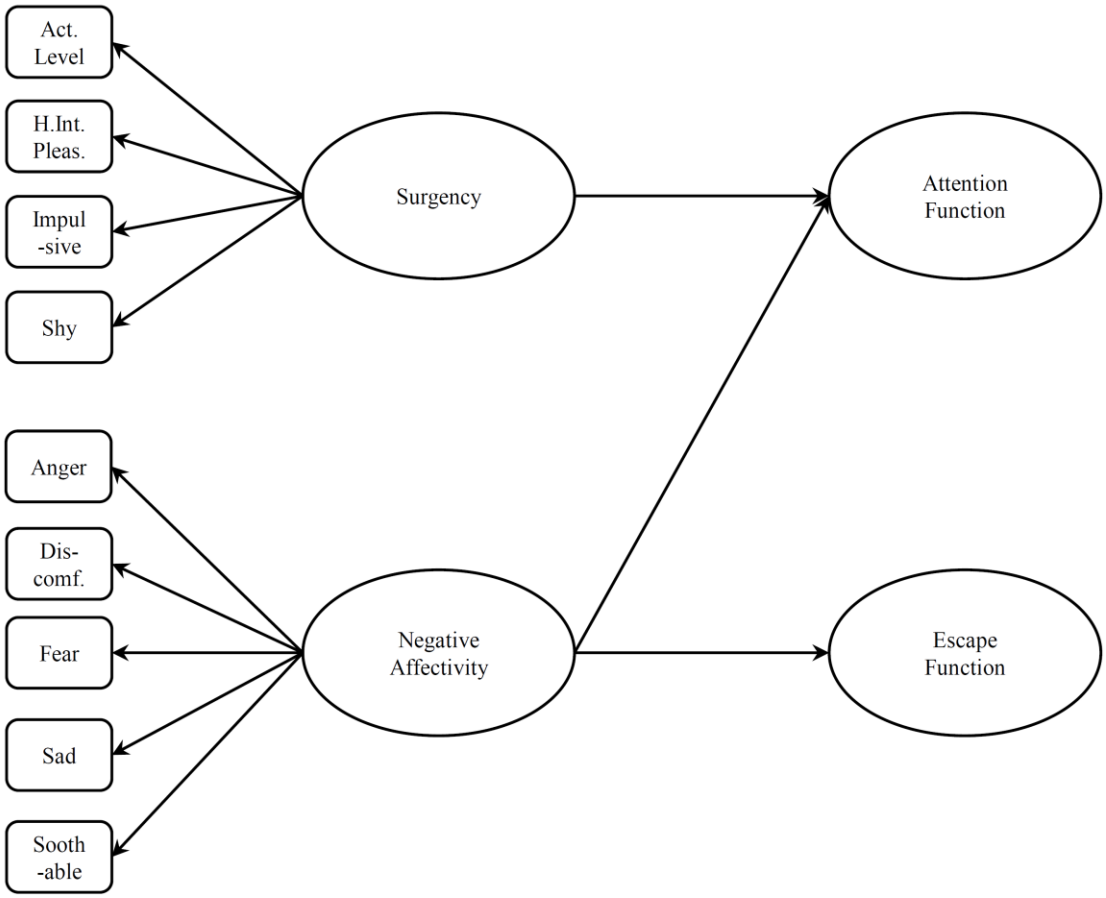

Figure A1. Hypothesized Relations Between Function and Temperament.

Note. Act. Level=Activity Level; H.Int. Pleas.= High Intensity Pleasure; Impulsive=Impulsivity; Discomf.=Discomfort; Sad=Sadness; Soothable=Soothability; Atten. Focus.=Attentional Focusing; L. Int. Pleas.=Low Intensity Pleasure; Per. Sens.= Perceptual Sensitivity.

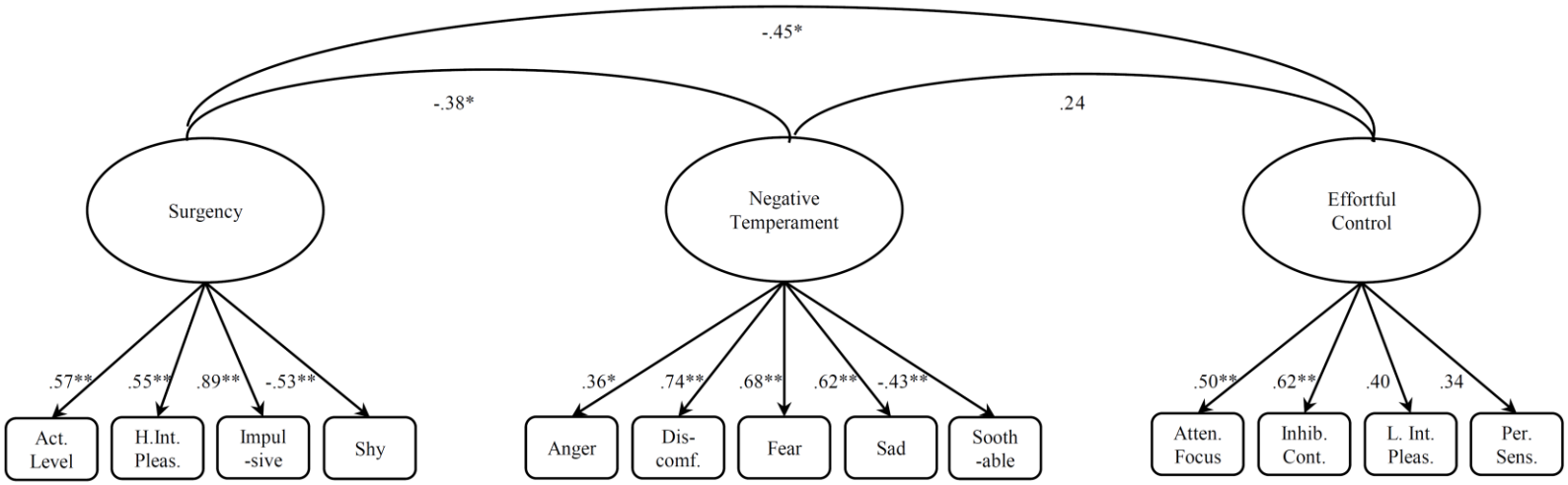

Figure A2. Confirmatory Factor Analysis for the Children's Behavior Questionnaire (CBQ).

Note. N=53 children aged 2-10, recruited from behavior assessment/treatment clinics at the Center for Disabilities and Development, University of Iowa Hospitals and Clinics. **p* ≤ .05; ***p* ≤ .01. Act. Level=Activity Level; H.Int. Pleas.= High Intensity Pleasure; Impulsive=Impulsivity; Discomf.=Discomfort; Sad=Sadness; Soothable=Soothability; Atten. Focus.=Attentional Focusing; Inhib. Cont.= Inhibitory Control; L. Int. Pleas.=Low Intensity Pleasure; Perc. Sens.=Perceptual Sensitivity.

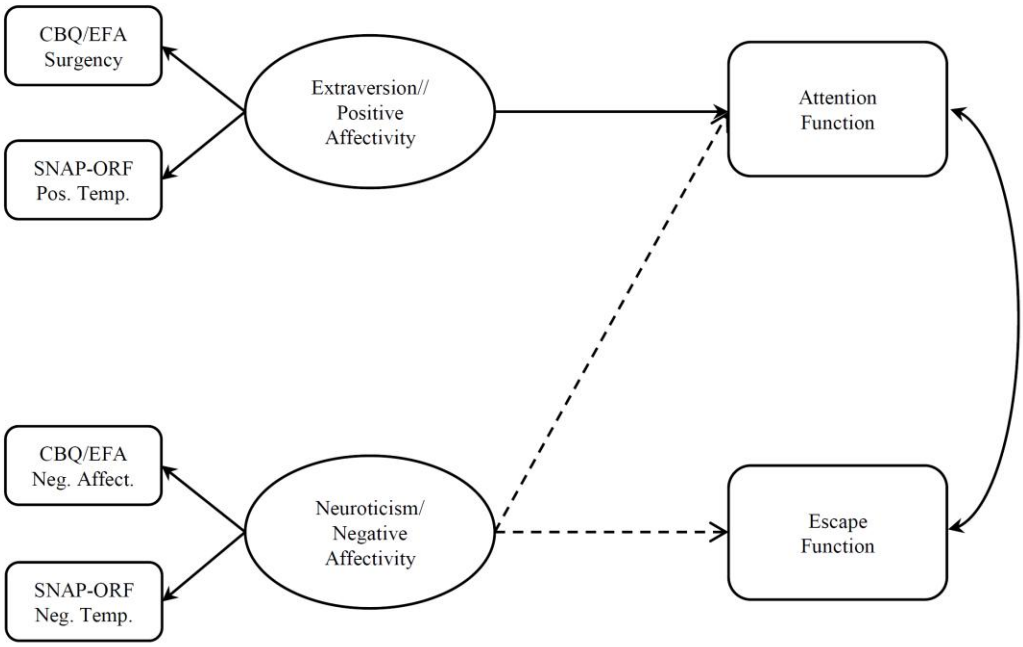

Figure A3. Final Model for Relations Between Function and Temperament.

Note. Solid lines indicate significant parameters in at least one model (see table 20). Dashed lines indicate parameters that were initially proposed, but dropped from analysis based on initial, zero-order results and non-significant findings in all tested models.

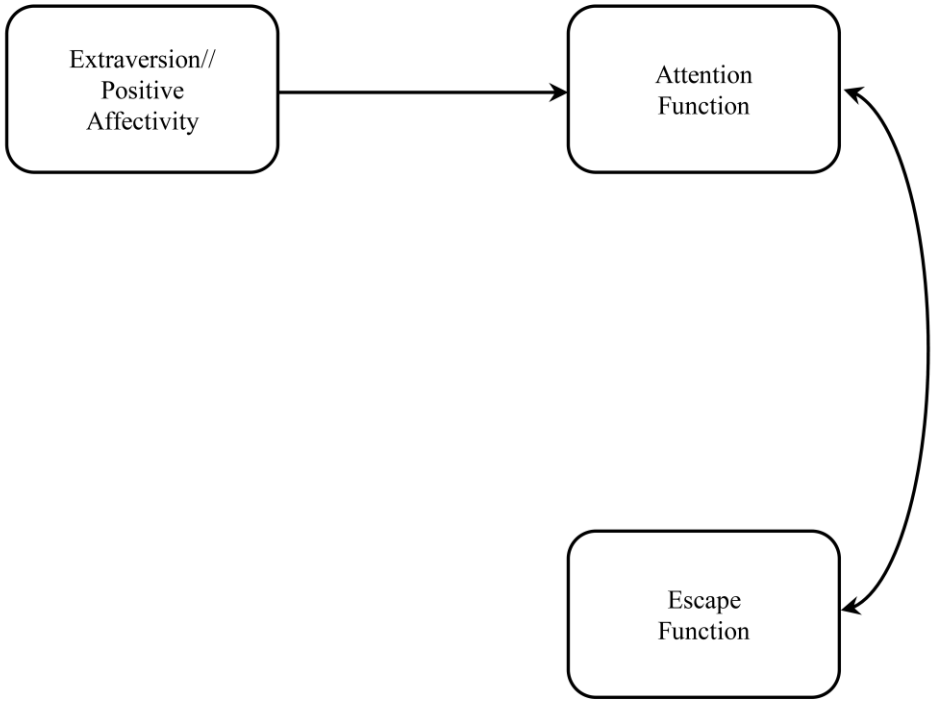

Figure A4. Path Analysis Model for Relations Between Function and Trait Scales.

Note. Solid lines indicate significant parameters in at least one model.

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