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ORIGINAL ARTICLE

Assessing the dominance behavioral system in early childhood using observational methods

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BACKGROUND
The dominance behavioral system (DBS) is a biologically based system that underpins individual differences in motivation for dominance and power. However, little is known about the DBS in childhood. In order to make strong claims about the DBS's trait-like properties and predictive validity, a clearer understanding of its early development is required.

PARTICIPANTS AND PROCEDURE
In a pilot study aimed at developing a behavioral coding system for dominance, a key facet of the DBS, we collected and coded observational data from 58 children, assessed at ages 3 and 5-6. These data were examined in conjunction with measures of child temperament via observational measures, and symptoms of psychopathology.

RESULTS
Dominance was moderately stable in early childhood to a degree comparable to other early child temperament traits. Consistent with the study hypotheses, boys were more dominant than girls, and dominance was negatively associated with children's behavioral inhibition, effortful control, and internalizing symptoms.

CONCLUSIONS
These results provide initial support for the validity and developmental sensitivity of an objective coding system for assessing facets of the DBS in early childhood. Ultimately, the use of this coding system will facilitate future studies of how early DBS predicts psychological adjustment later in life.

KEY WORDS
personality; assessment; temperament

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BACKGROUND

Human variation in dominance has evolved in the context of social hierarchies, playing a critical role in survival and reproduction. Dominance and related constructs have been studied from many vantage points, from behavioral ecology to personality psychology, under an array of different labels (Bugental, 2000; Shaver et al., 2011; Zuroff et al., 2010). In personality psychology, trait dominance is a critical component of the dominance behavioral system (DBS), originally described by Johnson and colleagues (2012). In this model, the DBS is a biologically based system that gives rise to individual differences in motivation for dominance, dominant behavior, and responsiveness to power (Johnson et al., 2012).

Recent interest in individual differences in the DBS is reflected in a small yet growing body of research focusing on its relations to an array of adaptive and maladaptive outcomes (Johnson et al., 2012; Tang-Smith et al., 2015; Tharp et al., 2021). Johnson and colleagues (2012) reviewed the relevant literature in adults, providing a summary of the correlates of the DBS with biological and affective processes and psychopathology. The goal of the review that follows is to familiarize the reader with the relevant developmental and trait literature on dominance, providing an overview of issues in the assessment of the DBS and illustrating how the study of DBS will benefit from a developmental perspective.

Research using self-report and observational approaches shows that elevated DBS and related constructs are associated with externalizing problems in adults, including psychopathy (e.g., Hall et al., 2004), substance use disorders (e.g., Krueger et al., 1996), and narcissism (e.g., Bradlee & Emmons, 1992). The DBS is negatively associated with internalizing disorders, such that low dominance, or high submissiveness, is associated with depression and anxiety (e.g., Gilbert, 2000, 2016). Indeed, trait dominance may partially account for the widespread comorbidity of internalizing disorders across the population (Johnson et al., 2012), given that both anxiety and depressive disorders are characterized by withdrawn and submissive behavior in the context of social interactions (e.g., Gilbert et al., 2002). However, these findings are drawn from research on adults, with little known about the development of the DBS in early childhood.

Theories of the DBS assert its strong biological bases (Johnson et al., 2012), suggesting that it should emerge and become relatively crystallized early in development. While developmental psychology has not focused on the DBS per se, there is a relevant literature focused on social dominance studied within groups of children (e.g., Hawley, 1999, 2002). Much of the work in this area has focused on discriminating between aggressive vs. prosocial or affiliative dominance strategies during development (Hawley, 1999, 2002). The developmental literature has also explored sex differences in dominance behavior in the early years, but similarly, has explored differences in strategies used by girls vs. boys, rather than trait dominance (e.g., Benenson, 1993; Martin & Fabes, 2001). In adults, personality research indicates that, across cultures, men are generally more aggressive and women are more submissive (e.g., Costa et al., 2001). In addition, most work shows that women tend to have lower social dominance orientation (i.e., an individual's preference for social hierarchy and the extent to which they desire "in-groups" to be superior to outgroups; Pratto et al., 1994) than men (Foels & Reid, 2010), suggesting that adult males may have higher trait dominance than adult women. It remains unclear, however, when differences in dominance emerge in development.

ASSESSMENT OF THE DOMINANCE BEHAVIORAL SYSTEM

Extant research on trait dominance is characterized by a wide range of measurement approaches and rating systems. Johnson and colleagues (2012) provide a detailed review of the methods used to index facets of the DBS in adults, which include self-report, implicit tasks (i.e., capturing automatic processes), observational measures, and indices of relevant psychophysiological processes. Currently, self-report measures are the most popular approach to measuring the DBS in adults, given that they are the standard approach to assessing most individual difference factors in adulthood due to their ease of administration and interpretation. However, self-reported ratings of DBS and relevant constructs are but one vantage point and may be susceptible to bias (Jackson et al., 2007). Most pertinently, self-report measures cannot readily be used with young children, limiting their use in developmental studies of the DBS. To our knowledge, there are few parent-report measures that directly assess trait dominance; rather, context-specific ratings (e.g., Buhrmester & Furman, 1990; Faith et al., 2015) or measures of relevant constructs (e.g., externalizing problems) are commonly used (e.g., Witt et al., 2009; Ostrov & Bishop, 2008). Thus, developmental studies of the DBS in childhood may benefit from methods designed to tap individual differences in early emerging dominance across early childhood.

Observational laboratory measures are well suited to address the aforementioned concerns. Laboratory tasks use standard stimuli designed to elicit behaviors of interest, which provide the opportunity to observe individual differences in a standardized context. In addition, laboratory tasks are coded by independent coders using objective criteria, avoiding the parental

biases in reporting that may influence parent reports (Hayden et al., 2010). The use of observational methods also circumvents the challenge of young children not yet having the linguistic and/or cognitive ability to self-report on their own behavior. In the developmental literature, observational laboratory tasks have a long and rich tradition (e.g., Kochanska et al., 1997), and a handful of studies have used such approaches to assess aspects of the DBS (Johnson et al., 2012). In the context of studying social hierarchies in childhood, studies have observed dominance in children using semi-structured or free-play contexts (e.g., Hawley & Little, 1999; Strayer & Strayer, 1976). However, to our knowledge, no studies have used observational measures to examine the *stability* of trait dominance across early childhood.

Such methods may help to address several key gaps in the literature on dominance. In particular, the study of trait dominance from the DBS as an early emerging temperamental constellation of traits is limited. Whether dominance shows stability early in development is unclear; however, early emerging stability is a defining aspect of temperament (e.g., Roberts & DelVecchio, 2000; Shiner & Caspi, 2012). In addition, it is unclear whether early dominance is sufficiently distinct from other, more thoroughly studied childhood traits to warrant its own research literature. In response to this research gap, we explored the utility of observational laboratory approaches to assessing dominance, a core feature of the DBS, in early childhood. Because some facets of the DBS require contemplation of internal states and desires (i.e., dominance motivation and self-perceived power) and are therefore challenging to assess in early childhood, we focused on coding overt dominance behaviors as a preliminary step in validating this method, using an adapted version of a trait-based rating scale (Interpersonal Adjective Scales – Revised [IAS-R]; Wiggins et al., 1988). To position our index of dominance within a broader nomological network, we examined correlations between dominance and other child temperament traits, as well as child psychopathology symptoms, given the literature linking adult DBS to psychopathology (see Johnson et al., 2012).

The purpose of this study was to gather preliminary descriptive data to direct future measurement development, rather than testing theoretical models. Although existing literature on trait dominance in childhood is limited, we hypothesized that (1) children's dominance would be stable across a time period of approximately 2.5 years; (2) boys would be more dominant than girls, (3) dominance would be negatively correlated with behavioral inhibition (BI) and effortful control (EC), and (4) dominance would be positively correlated with children's externalizing problems and negatively correlated with internalizing problems. We expected moderate effect sizes for these anticipated associations (Cohen, 1998). We examined these issues in a small pilot study of families as an initial, exploratory "proof of concept" study of the application of observational methods to the study of early trait dominance.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

Participants were 58 families (mother-father dyads and their children) recruited from an ongoing study of child emotional development. The larger study consisted of 409 families of typically developing three-year-olds at baseline who were recruited through Western University's developmental research participation pool, and by advertisements in local preschools, daycares, and recreational facilities (Kryski et al., 2011). A subset of 58 families agreed to participate for more extensive observational assessments of temperament and personality. This subsample did not differ significantly from the larger sample with regard to child Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2007) scores, internalizing or externalizing symptoms, family income, or race (*p*s > .12). Data for the current study were drawn from two waves of assessments occurring when children were approximately three (T1; $N = 58$, 30 girls, $M_{age} = 3.46$, $SD = 0.29$) and five to six years of age (T2; $N = 58$, 30 girls, $M_{age} = 5.95$, $SD = 0.31$). Children in this sample were predominantly White (91.4%), as identified by their caregiver. Approximately 52.8% of families were middle-class with an annual family income of $40,000-$100,000 CAD (9% with income < $40,000; 38.2% with income > $100,000). Children were of average cognitive ability based on a receptive vocabulary test completed at age three (PPVT; Dunn & Dunn, 2007), and had demographic characteristics consistent with those of the Southwestern Ontario population (Statistics Canada, 2022). This study was approved by the University of Western Ontario Health Sciences Research Ethics Board[1]. The primary caregivers provided consent for their participation, as well as their child's participation, in this study. There were missing data for family income ($n = 3$) and PPVT ($n = 2$) scores at T1, and one child was missing Child Behavior Check List (CBCL; Achenbach & Rescorla, 2001) questionnaire measures at T2.

MEASURES

Laboratory ratings of BI, EC, and dominance. BI, EC, and dominance were assessed via the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith et al., 1995) tasks at age 3 and age 5-6. The Lab-TAB is a battery of standardized, developmentally appropriate tasks designed to elicit individual differ-

ences in early emotion and behavior (e.g., Liu et al., 2021; Olino et al., 2013). Children participated in a total of 12 tasks from the Lab-TAB during their laboratory visit, which lasted approximately 1.5-2 hours, and all tasks were video-recorded for coding. Each of the Lab-TAB tasks, described subsequently, is designed to elicit emotions such as positive affect, sadness/anger, or fear, although children typically exhibit several emotions during each task. Our use of the Lab-TAB has been described in greater detail elsewhere, as a measure of emotionality (Durbin et al., 2007; Hayden et al., 2005) as well as behavioral inhibition and effortful control (Liu et al., 2020). Tasks are described below in the order in which they were administered along with the traits they were primarily intended to elicit.

We selected a subset of these tasks for coding dominance based on significant interpersonal interaction in the task. While dominance-related behavior in children has traditionally been observed within peer contexts (e.g., Hawley, 2002; Pelligrini & Long, 2002) the tasks we used involved children interacting with their parents or a research assistant. Given that conceptualizations of temperament emphasize the stability of traits across contexts (Goldsmith et al., 1987), as well as empirical data from both adults (Breil et al., 2019) and children (Durbin et al., 2007) showing cross-context stability of child temperament, examining children's behavior with adults should yield reliable indices of trait dominance that generalize across contexts.

AGE THREE LABORATORY ASSESSMENT

Risk room (BI). The child was left alone to play with a set of novel and ambiguous stimuli (e.g., a short staircase, a mattress) for five minutes, then asked to approach each object.

Tower of patience (EC, dominance). The experimenter and child took turns building a tower using large cardboard blocks. The experimenter waited a series of increasing delays (5, 10, 15, 20, and 30 seconds) before placing her block on the tower, thus forcing the child to wait increasingly longer periods of time before being given a turn.

Puzzle with parent (dominance). Based on the Teaching Tasks battery (Egeland et al., 1995), the primary caregiver and child were presented with a block puzzle designed to be challenging for young children and were instructed to work together to solve it.

Stranger approach (BI). The child was left alone in the main experimental area. After a few moments, a friendly male research assistant (unknown to the child) entered the room and spoke to the child while gradually moving closer to him or her.

Jumping spider (BI). The child was introduced to a terrarium containing a fuzzy, fake, black spider. The experimenter asked the child to touch the spider; when the child came closer to the spider, the experimenter manipulated the spider using an attached wire, making it appear to jump. At the end of several trials, the experimenter showed the child that it was a fake spider.

Snack delay (EC, dominance). The experimenter placed a candy under a transparent cup and told the child that he/she must wait until the experimenter rang a bell before picking up the cup and eating the candy. The experimenter waited a series of increasing delays (5, 10, 20 seconds), forcing the child to wait longer with each trial.

AGE FIVE LABORATORY ASSESSMENT

Exploring new objects (BI). The child and experimenter entered a room in which there were novel and ambiguous stimuli, including a skull, a box with a toy heart inside, and a box with rubber worms inside. The experimenter left the child alone to play with the objects in the room for 5 minutes. When the experimenter returned, she asked the child to interact with each stimulus in the room.

Friendly stranger (BI). The child was left alone in a room with a toy, and an unfamiliar male research assistant entered the room. Following a standardized script, he asked the child friendly questions while gradually walking closer.

Object fear (BI). The experimenter instructed the child to investigate "something scary" in a pet carrier, then left the child alone in the room. After one minute, the experimenter returned and asked the child about the item in the animal carrier, encouraging the child to look inside or put his or her hands in.

Simon says (EC). The child was asked to play a classic game of "Simon says," where he or she was expected to imitate the actions of a video-recorded experimenter (e.g., rub their tummy) only when the command was preceded with the words "Simon says."

Gift bag (EC). The child was left alone with a gift bag for three minutes and was told not to touch the gift until the experimenter had returned with the child's parent.

Puzzle with parent (dominance). The caregiver and child were seated at a table and presented with a bag of blocks that could be assembled in different ways to match pictures of figures on a set of cards. The experimenter instructed the dyad to recreate the figures on the cards one by one.

Not sharing (dominance). The experimenter and the child were seated at a table together. A research assistant entered the room and handed the experimenter a bag filled with candy, instructing her to share equally with the child. The experimenter initially divided the candies equally with the child, but then began to give herself more candy than the child

and finally took all the child's candy. At the end of the task, the experimenter acknowledged that she was not sharing fairly and gave the child half the candy.

CODING

Behavioral inhibition. Microcoding was used to measure BI by segmenting tasks into epochs of 10, 20, and 30 seconds. Facial, vocal, and bodily fear were coded within each epoch on a scale of 0 (*no fear*) to 3 (*high intensity fear*). For a detailed description of the coding for each task, see Liu et al., 2020. Scores for certain behaviors were reverse-coded so that higher scores in all tasks were indicative of higher BI. The final BI scales consisted of an average score of z-transformed codes across different tasks (age 3: $\alpha = .79$, $N = 39$; ICC = .71, $N = 32$; age 5: $\alpha = .88$, $N = 67$; ICC = .98, $N = 24$).

Effortful control. Tasks and coding schemes used to measure EC were adopted from Kochanska and colleagues (Kochanska et al., 1996, 1997, 2000). Children were coded on the ability to wait one's turn, as well as one's latencies to peek at or touch a stimulus of interest. For a detailed description of the coding for EC, see Liu et al., 2020.

The final EC scales consisted of an average score of z-transformed codes (and reverse-coded when necessary) across the *Tower of patience* and *Snack delay* tasks at age 3 ($\alpha = .79$, $N = 39$; ICC = .95, $N = 32$) and the *Simon says* and *Gift bag* tasks at age 5 ($\alpha = .64$, $N = 80$; ICC = .99, $N = 31$).

Dominance. To assess dominance, we selected tasks with significant interpersonal interactions for behavioral coding: the *Parent puzzle*, *Snack delay*, and *Tower of patience* tasks were used at the age 3 visit, and the *Parent puzzle* and *Not sharing* tasks were used at the age 5 visit. We coded these episodes using the Interpersonal Adjective Scales Revised (IAS-R), a 64-item self-report adjective list based on the interpersonal circumplex model (Wiggins, 1979), which characterizes behavior along two relevant axes: dominance/submissiveness and warmth/hostility (see Wiggins et al., 1988). Trained undergraduate and graduate student coders rated each child on each of the IAS-R adjectives (e.g., self-assured, boastful, bashful) on a scale from −2 (*very untrue*) to 2 (*very true*) for each task. Training involved rating several mock videos alongside a master coder followed by trainees independently coding videos in sets of 5. After the first several rounds of coding, trainees would meet with the master coder to discuss any discrepancies. When interrater agreement between the master coder and the trainees reached $\alpha = .80$ for training, coders began to code independently, and reliability checks occurred at approximately every 15 videos coded. In support of the stability of dominance across tasks and in interactions with different people, dominance coding was moderately to highly correlated across tasks at T1 and T2 (*M*r = .46; range = .30-.67).

The IAS-R adjectives can be reduced to eight interpersonal scales composed of eight items each: assured-dominant, unassured-submissive, warm-agreeable, cold-hearted, arrogant-calculating, unassuming-ingenuous, gregarious-extroverted, and aloof-introverted. For the purposes of this initial validation study focused on dominance, we focused on the assured-dominant and unassured-submissive scales, which were aggregated into a single Dominance-Submissiveness scale with a total of 16 items. Scales were averaged across tasks to create a final score on all scales for each participant. A subset of 12-20 children (20-34%; subset varied between tasks) were double-coded to assess inter-rater agreement for the dominance scale (age 3 ICC = .70; age 5-6 ICC = .79).

CHILD SYMPTOMS

We used the preschool version (1.5-5 years of age) of the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) to assess child symptoms at both age 3 and age 5-6. The CBCL instructs the respondent to rate the frequency and intensity of any emotional or behavioral problems the child has experienced over the past 6 months on a 3-point scale (0 – *not true*, 1 – *somewhat or sometimes true*, and 2 – *very true or often true*). The CBCL yields eight syndrome scales: aggressive behavior, anxious-depressed, attention problems, rule-breaking behavior, somatic complaints, social problems, thought problems, and withdrawn-depressed. Based on previous work implicating the role of excessive dominance in externalizing disorders, as well as submissiveness in anxious and depressed individuals (e.g., Gilbert, 2000), we focused on the broad internalizing subscale (a composite of anxious-depressed and withdrawn-depressed symptoms [age 3: $N_{items} = 18$, $\alpha = .76$; age 5-6: $N_{items} = 18$, $\alpha = .76$]), and the broad externalizing subscale (a composite of attention problems, rule-breaking, and aggressive behavior [age 3: $N_{items} = 45$, $\alpha = .87$; age 5-6: $N_{items} = 35$, $\alpha = .84$]) of the CBCL.

RESULTS

DESCRIPTIVE STATISTICS

All major study variables and bivariate correlations are presented in Table 1. Family income was moderately positively correlated with child PPVT scores, and negatively correlated with children's internalizing symptoms on the CBCL at age 3, EC at age 3, and BI at age 5-6. Race was significantly associated

Table 1

Bivariate correlations among major study variables

		1	2	3	4	5	6	7	8	9	10	11	12
1	Child sex	–	−.14	−.23	−.30*	.34**	.05	.17	−.10	.09	.27*	.30*	.20
2	Child age at age 3		–	.08	.06	.02	−.10	−.24	−.26	−.23	.17	−.33*	.21
3	Age 3 Dom			–	.56**	−.32*	−.07	−.02	.12	−.30*	−.33*	−.04	−.35**
4	Age 5.5 Dom				–	−.45**	−.21	−.26*	.01	−.21	−.20	.19	−.08
5	Age 3 CBCL Int					–	.41**	.40**	.07	.36**	.33*	−.08	.05
6	Age 3 CBCL Ext						–	.11	.46**	.07	−.03	−.10	.05
7	Age 5-6 CBCL Int							–	.39**	.08	.07	.11	−.15
8	Age 5-6 CBCL Ext								–	.06	−.40**	.17	−.12
9	Age 3 BI									–	−.01	.07	.09
10	Age 3 EC										–	.07	.39**
11	Age 5-6 BI											–	.06
12	Age 5-6 EC												–
13	*M*	1.52	3.46	0.18	0.13	0.36	0.71	0.39	0.60	−0.03	0.50	0.00	0.41
14	*SD*	0.50	0.29	1.65	0.63	0.34	0.50	0.32	0.45	0.33	1.81	0.47	0.41

Note. *$p < .05$, **$p < .01$; child sex: boys – 1, girls – 2; race: 0 – white, 1 – non-white; Dom – dominance; CBCL – Child Behavior Checklist; Int – internalizing subscale; Ext – externalizing subscale; BI – behavioral inhibition; EC – effortful control; *N*s = 55-58.

with dominance at both time points, such that White children were more dominant than non-White children. However, due to the ethnic homogeneity of this sample (i.e., only 5 children were non-White), these results must be interpreted with caution.

Dominance showed moderate-to-high stability over a time interval of approximately 2.5 years based on the correlation between age 3 and age 5-6 dominance. In addition, children's internalizing and externalizing symptoms were highly correlated with each other at both time points. EC also showed moderate stability across time points, whereas BI at age 3 was not significantly associated with BI at age 5-6[2].

Examining bivariate correlations to characterize relationships between dominance and other temperament traits showed that, as hypothesized, age 3 dominance was moderately negatively correlated with concurrent BI ($r = -.30$). Age 3 dominance was moderately negatively correlated with EC across age 3 ($r = -.33$) and age 5-6 ($r = -.35$), also consistent with the study hypotheses. Dominance was significantly correlated with child symptoms measured by the CBCL at both time points. More specifically, dominance at ages 3 and 5-6 was negatively correlated with concurrent internalizing problems ($r = -.32$ at age 3, $r = -.26$ at age 5-6). Contrary to our hypotheses, externalizing problems and dominance were unrelated either prospectively or concurrently and age 5-6 dominance was not significantly correlated with concurrent BI and EC.

DIFFERENCES BETWEEN BOYS AND GIRLS[3] IN DOMINANCE

Independent samples *t*-tests were used to compare dominance between girls and boys at both time points (see Table 2); we also examined differences between boys and girls in other temperament traits for the basis of comparison. Means and standard deviations were used to compute Cohen's *d*. At age 3, there was a trend-level difference between girls and boys with respect to dominance, with boys exhibiting higher dominance ($d = .47$). At age 5-6, boys were significantly more dominant than girls ($d = .62$). There was a similar pattern with respect to BI, such that boys and girls differed in BI only at the age 5-6 assessment, with boys being less inhibited than girls ($d = .62$). Conversely, in the case of EC, girls had higher EC than boys at age 3 but not at age 5-6 ($d = .55$).

DISCUSSION

The DBS has been linked to an array of important outcomes; however, little is known about its early development from an individual differences perspective. With the goal of informing future studies of the development of this construct, we examined the utility of an observational method for assessing dominance, a key component of the DBS, in early childhood. Our findings provide support for observa-

Table 2

Boys' and girls' dominance, BI, and EC at age 3 and age 5-6

	Boys		Girls		*t*(56)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Age 3 Dominance	0.57	1.56	−0.19	1.67	1.77	.082	.47
Age 5-6 Dominance	0.74	1.22	−0.06	1.36	2.35	.022	.62
Age 3 BI	−0.06	0.36	−0.01	0.31	−0.66	.513	.17
Age 5-6 BI	−0.15	0.33	0.13	0.54	−2.35	.023	.62
Age 3 EC	0.00	2.14	0.96	1.23	−2.07	.042	.55
Age 5-6 EC	−0.43	4.57	1.19	3.47	−1.53	.131	.40

Note. BI – behavioral inhibition; EC – effortful control.

tional ratings of children's dominance using laboratory paradigms, showing that dominance assessed in this way shows stability comparable to more widely studied child temperament traits assessed observationally (e.g., Durbin et al., 2007) and via parent report (Olino et al., 2013). Our laboratory-based observational method allowed us to observe individual differences in child behavior in standardized contexts likely to elicit DBS-related behavior, as well as the opportunity to objectively code these behaviors, which are strengths that observational measures of child temperament have over more commonly used parent-report measures (Liu et al., 2020).

We found that laboratory-assessed dominance was moderately stable over a period of approximately two years across the ages of 3 to 5-6 in a community sample of children. Considered in contrast to parent report, which capitalizes on the stability of test items and raters, the stability we found using laboratory ratings (r = .56) is especially salient.

Our measure of child dominance was correlated with other temperament traits in ways that are consistent with existing theories and research. First, age 3 dominance and BI were negatively correlated. Given that BI is characterized by low approach behaviors (Fox & Pine, 2012), its negative association with dominance, a construct which has been characterized by spontaneously engaging in social competition (Cohen et al., 1996), behaving assertively, and controlling the actions of others (Buss & Craik, 1980), is unsurprising.

In addition to its negative correlation with BI, dominance at age 3 was negatively correlated with EC at ages 3 and 5-6. Conceptually, the negative correlation between dominance and EC is consistent with the fact that behavioral expressions of low dominance are likely similar to those seen in children with higher EC. EC is thought to have a central role in successful interpersonal functioning as it allows individuals to inhibit self-focused impulses in consideration of others and of social norms (Vohs & Ciarocco, 2004). Very little research has examined the relationship between EC and dominance per se; however, both low EC and high dominance are implicated in externalizing disorders (Johnson et al., 2012).

Consistent with past work on the DBS in adults (Johnson et al., 2012), our measure of dominance was associated with children's internalizing symptoms, supporting the relevance of this construct in developmental psychopathology. Some conceptualizations of depression emphasize the role of excessive social comparison and the tendency to view oneself as inferior or subordinate (Swallow & Kuiper, 1988), or propose that the syndrome reflects the inability to recover from submissive experiences (Gilbert, 2016). Several studies have shown positive cross-sectional correlations of anxiety with self-reported submissiveness (e.g., Allan & Gilbert, 1997), behavioral indicators of submissiveness among adults (e.g., Galili et al., 2013), and retrospective reports of child submissiveness (e.g., Castihlo et al., 2014); however, to our knowledge, no previous studies have examined these associations during childhood. Due to the correlational nature of this study, we cannot assign causal status to the DBS as a risk factor for these disorders; however, our findings suggest an association between dominance and anxiety even in early childhood and support the relevance of studying the early development of the DBS in relation to psychopathology.

Although we did not find that dominance was meaningfully related to externalizing disorders in our study, significant externalizing problems were not present in this community sample, limiting our ability to detect such associations. In addition, the types of externalizing symptoms we assessed should be considered. Previous work has focused largely on adults and has suggested that excessive dominance is implicated in several externalizing syndromes of adulthood (Johnson et al., 2012; Stanton, 2017), including psychopathy, antisocial personality disorder, substance use disorders, and narcissism, with little

work on associations between the DBS and childhood externalizing syndromes. It is possible that the relevance of the DBS to externalizing problems emerges later in development, or in interaction with other core environmental or temperament features.

The negative correlations observed between concurrent BI/EC and dominance at age 3 were not observed at age 5-6. This could be due to the increased differentiation that occurs in child temperament with age (Shiner, 1998). This tendency implies that reliably attributing child behaviors to specific temperament traits is more challenging in younger children, which could mean that expressions of behavior influence raters' perceptions of multiple traits. For this reason, BI, EC, and dominance may appear more closely related earlier in development. Future studies that aggregate ratings of dominance across many contexts to reduce "noise" in assessments of dominance may be needed to better tap linkages between conceptually distinct traits.

Consistent with the existing social dominance literature (e.g., Charlesworth & Dzur, 1987; Neppl & Murray, 1997), we found that boys tended to be more dominant than girls at age 3 and were significantly more dominant than girls at age 5-6[4]. Given the negative associations of BI and EC with dominance as described above, these results are in line with findings that boys are less fearful and lower in EC than girls (Olino et al., 2013). This finding is consistent with the possibility that socialization processes become increasingly more important determinants of dominance as children age. Of import, observational approaches to studying sex and gender differences in temperament may be less influenced by sociocultural expectations of gender (i.e., as compared to self- or parent report), highlighting the strength of this method in addressing research questions focusing on temperamental differences between males and females.

In order to make broad claims about the predictive validity of trait dominance, it must be distinguished from near-neighbor constructs such as BI and EC, as well as other related temperament traits such as extraversion and aggression. The current study provides preliminary support towards this goal by demonstrating that, while there are significant, meaningful relationships between dominance, BI, and EC in children, they are not completely overlapping constructs. More sophisticated analyses, such as exploratory factor analysis (EFA), should be used in future observational work with larger samples to precisely identify the overlap for dominance and related constructs.

Similarly, multi-method assessment of the DBS, including the corroboration of parent or teacher report with observational data, is a goal of future study. To our knowledge, there is no validated parent or teacher report for the DBS. The self-rated Dominance Behavior System Scale (Tang-Smith et al., 2015) is a factor analytically derived scale covering six facets of the DBS, but it is not clear whether this scale is developmentally appropriate for use in young children, even if assessed by informant report. The development of multi-method assessment measures will help determine the convergent validity of the observational method for assessing the DBS.

STRENGTHS

The current study had a number of strengths, including the use of a longitudinal design, laboratory-based observational measures, and the use of a reliable and previously validated measure of interpersonal behavior (IAS; Wiggins et al., 1988). This study was also the first to investigate trait dominance specifically in children, contributing to an understanding of the trait's early development and associations with related constructs in early life.

LIMITATIONS AND FUTURE DIRECTIONS

However, this study also had several limitations. First, because our goal was to explore the initial validity of a coding system, we used a relatively small sample of children. Given that the findings from this pilot study support the utility of this method, future work should extend these findings by using larger samples. Second, while our laboratory-based measures did elicit DBS-related behavior, the tasks used were not specifically designed to measure the DBS. This constrained our ability to directly tap dominance motivation, dominance behavior, and responsiveness to power, which were originally described as individual facets comprising the DBS construct (Johnson et al., 2012). Third, we did not collect a parent-report measure of child dominance, which would have strengthened our validity analyses; however, given past work showing modest associations between laboratory and parent-report measures of child behavior (e.g., Gartstein & Marmion, 2008; Olino et al., 2013), high correlations between parent-reported child dominance and our laboratory measure would be improbable. We coded children's dominance in the context of their interactions with adults, rather than other children, which raises the issue of whether our findings would generalize to children's dominance in interactions with other youth. However, conceptualizations of temperament and empirical data (e.g., Goldsmith et al., 1987; Roberts & DelVecchio, 2000) both assert the stability of child temperament traits across contexts, suggesting that dominance in interactions with adults should be a valid index of trait dominance. In further support of this point, child dominance was at least moderately correlated across tasks with different adults and across time in the current study.

Lastly, we used basic bivariate correlational analyses, which are a standard index of stability in the field, but our relatively small sample limited the use of more sophisticated analyses such as EFA. Nonetheless, our system of rating episodes from a commonly used measure enhances the ability to apply these ratings within other studies.

CONCLUSIONS

Our findings support the potential of the DBS in furthering our understanding of the interplay between temperament and psychopathology. This study showed that an observational coding system for the DBS exhibited construct validity in a sample of young children as evinced by moderate to high stability of the trait over a two-year follow-up interval. Dominance was also related to other temperament and symptom constructs in ways that were generally consistent with theory and existing evidence in adults (Johnson et al., 2012).

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Disclosure

The authors declare no conflict of interest.

Endnotes

1 A significant portion of this paper has been published in Western University's repository as the first author's Master's thesis.

2 This result is somewhat unexpected given that BI was relatively stable (r = .28, p < .01) in the larger sample of 409 children (e.g., Kotelnikova et al., 2015; Liu et al., 2020).

3 Because parents indicated via questionnaire whether their three-year-old children were boys or girls, we refer to "sex" when describing the specific construct measured in the current study.

4 The Dominance-Submissiveness scale showed adequate variability in both boys and girls.

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