PSYCHOSOCIAL AND EXECUTIVE FUNCTIONING IN CHILDREN WITH CONGENITAL HEART DISEASE: DO CAREGIVERS AND TEACHERS REPORT THE SAME BEHAVIORS?

By

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(Under the Direction of Ronald L. Blount)

ABSTRACT

Objective: This study aimed to examine psychosocial and executive functioning abilities in children with Congenital Heart Disease (CHD) compared to normative expectations as well as explore agreement between caregiver and teacher informants on these domains. Although guidelines have proposed the administration of brief measures to multiple informants to monitor neurocognitive and psychosocial development, no research to date has examined the profiles of functioning in a clinically-referred sample or the degree to which reporters vary on their responses. *Method:* Caregivers and teachers of 71 clinically-referred children with complex CHD completed measures of executive and psychosocial functioning. *Results:* Compared to norms, caregivers and teachers of children with CHD endorsed significant impairment across all domains of executive functioning and multiple psychosocial domains. Informants endorsed impairment that was 2 to 5 times higher than observed in the general population. *Conclusion:* Measures of executive and psychosocial functioning indicate the presence of substantial impairment in clinically-referred children with CHD. The high rates of proxy-endorsed concerns

of psychosocial and executive functioning deficits highlights the need for intervention and support services for children with complex CHD and their families.

INDEX WORDS: Psychosocial functioning, Executive functioning, Congenital Heart Disease, Caregiver, Teacher

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CHAPTER 1

INTRODUCTION

PSYCHOSOCIAL AND EXECUTIVE FUNCTIONING IN CHILDREN WITH CONGENITAL HEART DISEASE: DO CAREGIVERS AND TEACHERS REPORT THE SAME BEHAVIORS?

Congenital Heart Disease (CHD) refers to the classification of structural heart defects that develop during the prenatal period in approximately 4-10 of every 1,000 live births annually (Botto, Correa, & Erickson, 2001; Mozaffarian et al., 2015). While the cause of these defects is generally unknown, proposed models speculate that development of the defect may be related to genetic abnormalities, environmental toxins, and the interaction of both. Historically, mortality rates for infants with CHD were high and life expectancy of children was considered to be low (Saigal & Doyle, 2008). However, with the advancement of medical technologies, significant improvements have been made in early detection, medical interventions, and palliative care procedures, thereby increasing the life expectancy of children with CHD into adulthood (Khairy et al., 2010).

Few defects resolve spontaneously, with most requiring surgical procedures to improve cardiac functioning. Many of these procedures are considered palliative and cardiac functioning may continue to be affected. Significant medical events, including surgical intervention, complications, and extended periods of suboptimal blood oxygenation levels or cardiac functioning have been related to long-term neurodevelopmental deficits and structural abnormalities in the brain (Karl, et al., 2004; McQuillen & Miller, 2010). Surgical intervention alone presents additional long-term risks including post-operative complications and brain insults

related to prolonged anesthesia exposure (Wise-Faberowksi, Quinonez & Hammer, 2014). Therefore, while the improvement in survival rates of CHD patients is positive, notable consequences, particularly to neurocognitive development, have shown to be an area of increasing concern for pediatric patients (Ballweg, Wernovsky & Gaynor, 2007; McQuillen & Miller, 2010; Wernovsky, 2006; Wernovsky, Shillingford & Gaynor, 2005;). Risks to neurocognitive development present as early as prenatal gestation, given the co-occurring organ formation of the heart and brain, which are linked through shared genetic pathways (McQuillen, Goff, & Licht, 2010). Malformations in cardiac structure impose a unique risk to brain development both in utero and postnatally. For example, impaired fetal blood flow has been speculated as a risk factor for abnormal white matter maturation, resulting in structural abnormalities unique to neonates with CHD (McQuillen, et al., 2010). Many infants with CHD are born prematurely and cyanotic (e.g., lacking oxygen at birth), further increasing their susceptibility to impairment of structural development. The interaction between brain and cardiac functioning is detectable across the developmental spectrum suggesting that individuals with CHD may suffer continued impact on cognitive functioning, particularly in areas associated with language acquisition, motor coordination, and executive functioning, among others (Miatton, De Wolf, Francois, Thiery, & Vingerhoets, 2007).

In addition to cognitive deficits, behavioral and psychosocial concerns as well as impairment in executive functioning (e.g., metacognitive reasoning and behavioral regulation) have been reported across samples of children with various subtypes of CHD (Calderon et al.,

2010; Cassidy, White, DeMaso, Newburger, & Bellinger, 2014; Miatton et al., 2007). Using a sample of children and adolescents with CHD ranging from mild to severe complexity, executive functioning abilities were compared to a normative sample (Cassidy et al., 2014).

Using proxy-report, 56.3% and 57.1% of children with CHD were reported to experience 'clinically significant' (≥ 1.5 *SD*s above the mean) difficulties with executive functioning on at least one domain based on parent and teacher report, respectively. While the presence of a deficit in any one of several combined domains of functioning was reported, this study neglected to report the prevalence of significant impairment on each individual domain of executive functioning. Additionally, the research-referred sample represents the full spectrum of CHD, from mild through complex. It is likely that deficits would have been greater if only children with complex CHD had been assessed.

Given the reported prevalence of neurocognitive delays and behavioral impairment experienced by children with CHD, a proposed algorithm was suggested by the American Heart Association to identify categories of CHD patients at the greatest risk for developmental delays (Marino et al., 2012). Some of the identified risk factors for deficits include open heart surgery, cyanotic heart lesions requiring shunt placement, premature birth, cardiopulmonary resuscitation, prolonged hospitalization, and peri- or postoperative seizures, among others (Marino et al., 2012). Using the proposed algorithm, the prevalence of neurocognitive impairment across domains of functioning is expected to increase with the complexity of CHD (Marino et al., 2012). It should be noted that while children with comorbid syndromes (e.g., Down Syndrome) and palliated neonates represent those at the highest risk for neurocognitive impairment, these patients' cognitive functioning may be uniquely impacted as a feature of the syndrome or having had neonatal surgery rather than due to cardiac functioning per se. Given that the literature has yet to comprehensively document the degree of dysfunction for patients across levels of cardiac complexity, additional research is necessary to assist in the identification of children at high-risk through early screening procedures. Recommendations made by the American Heart Association

to enhance early screening assessments may yield important information relevant to monitoring cognitive and psychosocial development.

A comprehensive review of the current state of screening, evaluation, and management of pediatric CHD patients was conducted by Marino and colleagues (2012) in an effort to formalize recommendations for comprehensively monitoring neurodevelopmental outcomes in these patients. A greater emphasis was placed on the identification of children considered to be at high-risk for neurocognitive impairment based on cardiac complexity and relevant risk factors within their medical history. Through the implementation of cardiac neurodevelopmental clinics, neuropsychological evaluation aims to identify deficits and propose relevant interventions to enhance neurocognitive development for children across domains of functioning (Brosig et al., 2014). As a part of the American Heart Association's guidelines for screening and assessment, inclusion of both caregiver and teacher proxy-report was proposed in an effort to establish a more comprehensive evaluation of the identified child's functioning across environments. The use of multiple informants for psychosocial screening to identify at-risk children needing further follow-up is consistent with the mental health guidelines for primary care settings suggested by the 2010 American Association of Pediatrics (Foy, 2010). However, the use of multi-informant screening of psychosocial functioning in children with CHD has not been thoroughly evaluated, in part due to a lack of research conducted in clinical settings. While every child with CHD may benefit from comprehensive evaluation, the number of available professional resources may be limited across institutions, thus highlighting the need to further hone the assessment process.

In addition to the use of screening to help identify children needing comprehensive neuropsychological assessment (Marino et al., 2012), the evaluation of behavioral and psychosocial functioning is distinctly important given the prevalence of aforementioned

executive functioning deficits as well as internalizing (e.g., depression, anxiety) and externalizing (e.g., behavior regulation, attention) problems reported in the broad sample of children with CHD (Karsdorp, Everanerd, Kindt, & Mulder, 2007). A meta-analytic review concluded that behavioral deficits are more frequently reported in children with CHD during school-age compared to when they are toddlers, denoting a critical time period to assess these domains of functioning (Karsdorp, et al., 2007). The prevalence of caregivers endorsing clinical concerns for internalizing or eternizing problems was approximately 16% and 15%, respectively, in a sample of children with d-transposition of the great arteries (Bellinger et al., 2008). Similar concerns were endorsed using teacher-proxy report in this sample, with 22% and 16% of children meeting clinical concerns for internalizing and externalizing problems, respectively. Additional studies have reported similar findings using proxy-report for internalizing (23%) and externalizing (16%) behaviors in children with the same cardiac defect (Latal, Helfricht, Fischer, Bauersfeld, & Landolt, 2009).

While the prevalence of behavioral deficits in children with CHD is similar across samples, the paucity of research utilizing or evaluating the degree of agreement between multiple informants in different settings has not been adequately addressed. In a study by Shillingford et al. (2008), when using either parent or teacher reports of psychosocial functioning to categorize school-age children into "intermediate" to "high risk" for inattention and hyperactivity, approximately one quarter to one third of the sample met criteria. However, only a small portion of children were identified by both reporters as falling into those categories of impairment. Children identified as high risk by one reporter may have fallen into the average range by a second reporter. In the aforementioned study by Cassidy et al. (2014), caregiver, child, and teacher reports were collected and analyzed. Children's self-report was significantly lower than

caregiver or teacher report, indicating that children perceived less impairment in areas of executive functioning than was observed by other adults in their environment. However, no indication of agreement between caregiver and teacher were reported in that sample. One study examined the interrater agreement of caregiver and teacher report, concluding that parents report greater behavioral difficulties overall (Oates, Turnbull, Simpson, & Cartmill, 1994). However, this study utilized a sample of children post-cardiac surgery and was not limited specifically to children with CHD. Taken together, although the utility of multi-informant report has been identified as an important guideline for screening of neurodevelopmental and behavioral difficulties, the literature has not adequately examined the degree to which caregiver and teacher report of executive and psychosocial functioning agree for children with CHD, particularly those with complex CHD who are at high-risk for neurocognitive deficits. This is important for practical utilization of these screening measures, as it is unclear whether the second informant adds additional unique information, and whether the additional information is worth the cost of gathering that information.

Consistent with the American Heart Association's guidelines for assessment, the use of multiple informants has been recommended in other areas of research for gaining a more comprehensive assessment of children's behavior (Hunsley & Mash, 2007). Caregivers' perspectives provide a subjective account of observable behaviors in the home whereas teachers' responses capture observations at school (Kraemer et al., 2003). However, understanding the extent of agreement in different reporters' responses is important in interpreting their assessments. Differences in reporters' endorsement of behaviors could signify meaningful information beyond measurement error (De Los Reyes, 2011). For example, interactions between the child and their teacher versus their parent may differ because of differences between the

child's temperament and adults' personalities, or differences in these adults' behavioral expectations, thereby evoking different behaviors in the school and home settings (Achenbach & Rescorla, 2001; Comer & Kendall, 2004). Additionally, while standardized measures may aim to capture specific behaviors, informant discrepancy may arise given differences in the opportunities to perform the specified behaviors (Achenbach, McConaughy, & Howell, 1987). For example, answering the telephone and responding appropriately would be more likely to occur at home than in school. Another factor affecting measure completion is each reporter's interpretation and recall of behavior, which may be subject to attributional bias. Interpretation and recall could be affected by subjective factors, such as the rater's history, which may influence how different adults determine causality for the same child behavior (De Los Reyes & Kazdin, 2005). In the context of children with CHD, while it may be valuable to assess psychosocial and executive functioning concerns from the perspective of both teacher's and caregiver's observations, little is known about the degree to which these reporters agree on behavioral symptoms.

Proposed Study

The current study examines the degree of psychosocial and executive functioning deficits in a sample of clinically-referred children with complex CHD based on caregiver and teacher report of their behavior. Children with complex CHD represent those at high risk for neurocognitive deficits. Additionally, while the guidelines propose the inclusion of multiple informants in clinical assessment, limited empirical research has examined this practice. The objectives of the study are threefold: 1) to compare behavioral symptoms of specific domains for psychosocial and executive functioning in clinically-referred children with complex CHD relative to normative expectations, 2) to determine the prevalence of children meeting 'at-risk' or

'clinically significant' criteria across domains of psychosocial and executive functioning, and 3) to determine concordance between caregiver- and teacher-proxy report of these behaviors. To assess these objectives the following hypothesis will be explored: 1) compared to normative expectations, both caregivers and teachers will report greater levels of behavioral dysfunction across all domains for both psychosocial and executive functioning, 2) the percentage of children with CHD meeting at-risk or clinically significant criteria will be greater than the expected 15% of the sample based on normative groups, and 3) caregiver- and teacher-proxy report of psychosocial and executive functioning will be congruent.

CHAPTER 2

METHOD

Participants

Participants included 71 children and adolescents who had a diagnosis of complex CHD. Proxy-report of functioning was provided by one of the participant's caregivers and teachers, as a part of a comprehensive neuropsychological evaluation after being referred by medical staff. Retrospective chart reviews were conducted to build a database of children with CHD who received neuropsychological testing between the years of 2007-2015. Inclusion criteria for this specific study included children who: 1) had a previous diagnosis of CHD, 2) were between the ages of 6 and 18 years old, and 3) had measures that were completed by both caregiver and teacher. Children with syndromic CHD (e.g., Down Syndrome) were excluded from search criteria when building the larger database given differences in the presentation of these children.

The present sample represents predominantly male (n = 48; 67.6%) children and adolescents between the age of 6 and 18 years (M = 10.16, SD = 2.73). The majority of participants were Caucasian (n = 44; 62.0%), followed by African American (n = 18; 25.4%), Hispanic (n = 3; 4.2%), Asian (n = 3; 4.2%), and biracial (n = 3; 4.2%). While most children were born full term (n = 51; 71.8%), about a quarter of the sample was born prematurely (n = 18; 25.4%). Gestational age was unknown for two participants given their adoptive histories. Review of medical histories indicated that the majority of participants were cyanotic (n = 64; 90.1%) and had double-ventricle cardiac anatomy (n = 43; 60.6%). The most common CHD diagnoses included ventricular septal defect (n = 20), Tetralogy of Fallot (n = 16), Hypoplastic Left Heart

Syndrome (*n* = 16), and Transposition of the Great Arteries (*n* = 13). Significant medical histories were captured for a subsample of participants, with 22 children (31%) having undergone the Fontan procedure and 4 children (5.6%) having received a heart transplant.

At the time of neuropsychological testing, children were enrolled in grades kindergarten through 12th grade with 27.9% (*n* =19) having repeated a grade at some point prior to testing. The majority of children and adolescents were enrolled in either public (*n* = 48; 67.6%) or private (*n* = 15; 21.1%) education. Review of developmental history indicated possible (7%) or clear (43.7%) delays for both gross motor and speech/language development with the majority of children receiving early intervention services before age 5 (*n* = 38; 53.5%). While the caregiver's relationship to the child was not indicated at the time of measure completion, maternal education level was captured as the following: 7th-11th grade (*n* = 3; 4.2%), high school graduate (*n* = 9; 12.7%), vocational training/some college (*n* = 17; 23.9%), college graduate (*n* = 21; 29.6%), graduate degree (*n* = 18; 25.4%), not available/provided (*n* = 3; 4.2%). Paternal education completion was as follows: 7th-11th grade (*n* = 3; 4.2%), high school graduate (*n* = 16; 22.5%), vocational training/some college (*n* = 16; 22.5%), college graduate (*n* = 17; 23.9%), graduate degree (*n* = 11; 15.5%), not available/provided (*n* = 8; 11.3%).

Procedure

This study is in full compliance with the Health Insurance Portability and Accountability Act (HIPAA) and has been approved by the Institutional Review Boards at participating institutions. Retrospective chart reviews were conducted through the neuropsychology department at a private children's hospital in the Southeastern United States. Prior to neuropsychological testing, legal guardians completed a HIPAA release and endorsed consent of their child's medical records to be used for research purposes during their initial intake. All

testing was conducted in an outpatient setting as a part of clinical care under the supervision of a board-certified licensed neuropsychologist. Given that assessment batteries varied in length by provider and presenting problem, not every child had identical completed reports. Parents/guardians provided relevant background information during an interview with the neuropsychologist. Medical information was supplemented with information obtained through the review of the child's medical records to confirm diagnoses and disease complexity. Final neuropsychological reports for all eligible participants of the larger study were entered into a database with relevant information extracted from the report. Confirmation of medical diagnosis and cyanotic status was completed by appropriate medical staff. The larger database comprised of 210 children and adolescents (3.25-20.00 years) with CHD who were assessed between 2007 and 2015. This databased was utilized to identify eligible school-aged children for the present study. Twenty seven patients were excluded for being outside the identified age criteria and a subsequent 112 patients were excluded due to incomplete or never administered parent and/or teacher report, resulting in a total of 71 patients meeting all study criteria.

Measures

Demographic, Medical, and Developmental Variables

Information on children's medical history was systematically extracted from the completed neuropsychological assessment. Cyanotic status at birth as well as single/double ventricle status was confirmed through medical record review by medical personnel. During their assessment, parents/legal guardians provided demographic information, as well as developmental and academic history for their children. This information, along with referral source, concerns at the time of assessment, and hand-dominance, was extracted from the final neuropsychological report.

Psychosocial Functioning

Caregivers and teachers provided proxy-report of psychological functioning for children using the Behavioral Assessment System for Children, second edition (BASC-2-PRS and BASC-2-TRS; Reynolds & Kamphaus, 2004). Participants were asked to respond to items using either a true or false scale, or a 4-point Likert scale from '0' indicating that a behavior never occurred to '3' almost always occurred. Caregivers and teachers completed the entire measure (156-175 items), and appropriate items were summed to generate subscale scores. Composite scores were derived from the summation of appropriate subscales scores. For the majority of scales, higher scores on this measure indicate greater psychosocial distress. For the Adaptive Functioning composite and subscales, lower scores indicate greater impairment. Subscale and composite scores were converted to T-scores using age- and gender- matched norms. For the majority of subscales and composites, T-scores $\geq$70 are considered clinically significant indicating notable impairment, and scores between 60 and 69 are considered at-risk. For the Adaptive Functioning Composite and subscales, T-scores $\leq$ 30 are considered clinically significant, and scores between 31and 40 are considered 'low.' Internal consistency and convergent validity for the BASC-2-PRS and BASC-2-TRS has been demonstrated to be good (Reynolds & Kamphaus, 2004). In the present sample, internal consistency on the BASC-2-PRS ranged from excellent to acceptable for the Externalizing Composite (.93), Internalizing Composite (.82), Behavioral Symptoms Index (.77), and Adaptive Composite (.94). Internal consistency on the BASC-2-TRS also demonstrated excellent to good consistency for the Externalizing Composite (.94), Internalizing Composite (.79), Behavioral Symptoms Index (.85), and Adaptive Composite (.90).

Executive Functioning

Caregiver- and teacher-proxy reports of executive functioning skills were assessed using parent and teacher versions of the 86-item Behavior Rating Inventory of Executive Function (BRIEF-PF, BRIEF-TF; Gioia, Isquith, Guy, & Kenworthy, 2000). Caregivers and teachers were asked to consider the past 6 months when responding to statements regarding how often they observed particular behaviors. This measure utilizes a 3-point scale ranging from never to often and index scores were calculated by summing the total responses for items on each particular scale. Composite scores were calculated separately to assess both the behavioral regulation (e.g. inhibitory control, shifting, emotion control) and metacognitive (e.g., task initiation, planning, organization, self-monitoring) aspects of executive functioning. Scores were converted to T-scores using gender and age-referenced scores for individual indices and composite scores. Higher scores on indices and composites indicate greater perceived executive dysfunction. T-scores ≥65 are considered clinically significant indicating notable impairment, and scores between 60-64 warrant clinical interpretation. In an effort to use consistent nomenclature between both the BRIEF and the BASC-2, T-scores ranging in the warrant clinical interpretation category of the BRIEF were renamed at-risk. Given the normative distribution of the measure, expected performance T-scores (M = 50; SD = 10) were used for between group analyses. Internal consistency and convergent validity for the BRIEF-PF and BRIEF-TF has been demonstrated to be good (Gioia et al., 2000). In the present sample, internal consistency was excellent (.91 and .96) for the Global Executive Composite for the caregiver and teacher versions, respectively.

Data Analytic Plan

All analyses were conducted using IBM SPSS Statistics, Version 23. Descriptive statistics including means, standard deviations (*SD*), and ranges were calculated for all

demographic variables and each subscale/composite of the BRIEF-PR/TR and the BASC-2-PRS/TRS. To determine whether differences in mean scores were related to demographic characteristics, Pearson product moment correlations were used to examine the relationship between composite scores and continuous or ordinal demographic variables (e.g., child age, CHD diagnosis, and maternal education level). To examine the relationship between subscale/composite scores and dichotomized demographic or medical variables (gender, cyanotic status at birth, pre-term birth, and number of ventricles), point biserial correlations were conducted.

Primary Analyses

Mean differences in the sample's executive functioning and psychosocial symptoms compared to values from the normative samples were evaluated using one-sample *t*-tests, with Cohen's *d* values used to indicate effect size (Cohen, 1988). As the caregiver and teacher versions of the BRIEF and BASC-2 utilize a T-score distribution, the sample will be compared to $M = 50$ ($SD = 10$). To determine the portion of the sample that meets clinically significant, or at-risk criteria for impairment, scores were coded to reflect these categories and percentages were reported. Evaluation of consistency in responses between caregivers and teachers was explored first using paired-sample *t*-tests and Cohen's *d* for effect size to examine differences between informants. Given the continuous nature of the T-score variables, intraclass correlation coefficients (ICC) were selected as the appropriate statistical analyses to capture interrater reliability. ICCs estimate the amount of observed variance due to similarity between raters and parses out error variance or differences in ratings between informants. Higher ICC values represent greater shared variance between raters (Hallgren, 2012). Extant literature suggests the

use of both statistics for a comprehensive and methodologically rigorous approach to evaluating multiple informants' reports (De Civita, et al., 2005).

Power Analyses

Power analyses were conducted using G*Power (Faul, Erdfelder, Lang & Buchner, 2007) to determine the appropriate sample size for the proposed analyses. To detect differences between the sample and normative values, using $\beta = .95$, $\alpha = 05$, and a medium effect size (.30), a sample of 45 participants was necessary. To detect differences between caregiver and teacher report using a paired samples *t*-test and to determine reliability using an intraclass correlation coefficient, with $\beta = .95$, $\alpha = 05$, and a medium effect size (.50), a sample of 54 participants was required for both analyses.

CHAPTER 3

RESULTS

Preliminary Analyses

Descriptive statistics including means, *SD*s and ranges for caregiver psychosocial functioning are shown in Table 1, for teacher psychosocial functioning are shown in Table 2, for caregiver executive functioning are shown in Table 3 and for teacher executive functioning are shown in Table 4. Bivariate correlations revealed significant associations with the following study variables and either demographic or medical factors: Age was significantly associated with two caregiver BRIEF subscale scores (Working Memory: $r = .32$, $p < .01$; Plan/Organization: $r = .26$, $p = .03$), and three teacher BRIEF subscale and two composite scores (Shift: $r = .26$, $p = .03$; Plan/Organization: $r = .36$, $p < .01$; Monitor: $r = .35$, $p < .01$; Metacognition Index: $r = .31$; $p < .01$; Global Executive Composite: $r = .30$, $p = .01$), however age was not significantly associated with caregiver or teacher reports of psychosocial functioning. Gender was significantly associated with caregiver report of Hyperactivity ($r = .28$, $p = .02$), Conduct Problems ($r = .30$, $p = .01$), and Externalizing Problems ($r = .27$, $p = .02$) on the BASC-2, such that males exhibited more difficulties in these domains than females. Gender was only associated with one domain on caregiver report of executive functioning on the BRIEF (Organization of Materials; $r = .30$, $p = .01$) with males demonstrating greater deficits. Gender was not correlated with teacher report of psychosocial or executive functioning. Cyanosis was associated with subscales and composite scores for caregiver report on the BRIEF (Shift: $r = .25$, $p = .03$; Emotion Control: $r = .27$, $p = .02$; Plan/Organization: $r = .31$, $p = .01$; Behavior Regulation Index: $r = .24$, $p = .05$; Global

Executive Composite: $r = .25$, $p = .04$), but was not associated with teacher report nor either reporter's ratings of psychosocial functioning). Cardiac anatomy (single versus double ventricle) and gestational age (≤ 37 weeks, ≥38 weeks) was not associated with caregiver or teacher report on any domain of interest. Given that there were no notable patterns of differences that emerged for demographic variables, no additional analyses were conducted to further examine between-group differences based on demographic factors.

Psychosocial Functioning of Children with CHD Compared to Norms

T-test analyses were conducted to compare psychosocial functioning in the present sample to those of an age-matched sample. Using caregiver report, analyses revealed that children and adolescents with CHD are perceived for most of the dimensions assessed as having greater behavioral difficulties and worse adaptive functioning when compared to normative expectations for a healthy sample (Table 1). Specifically, caregiver's perceptions of the following subscales demonstrated significantly greater impairment than norms; Hyperactivity, Conduct Problems, Anxiety, Depression, Somatization, Atypicality, Withdrawal, Attention Problems, Leadership, Activities of Daily Living, Functional Communication. Per caregiver report, all four composite scores (Externalizing Problems, Internalizing Problems, Behavioral Symptoms Index, Adaptive Skills) also demonstrated greater impairment than healthy peers. Cohen's *d* revealed small to large effect sizes for these domains with the greatest differences in Attention Problems ($t = 10.23$; $d = 1.29$) and Activities of Daily Living ($t = -5.96$; $d = .81$). Only three domains were not significantly different from norms (Aggression, Adaptability, Social Skills).

Teacher report of psychosocial functioning demonstrated similar results with greater impairment reported across the majority of domains (Table 2). In the classroom environment,

youth with CHD are perceived as having significant difficulties in the following domains; Hyperactivity, Anxiety, Depression, Atypicality, Withdrawal, Attention Problems, Learning Problems, School Problems, Leadership, Study Skills, and Functional Communication). Using teacher report, three composite scores were significantly different than healthy peers (Internalizing Problems, Behavioral Symptoms Index, Adaptive Skills). Examination of the magnitude of these domain differences revealed medium to large effect sizes using Cohen's *d* with greatest differences in Attention Problems ($t = 7.61$; $d = .94$), Learning Problems ($t = 6.52$; $d = .85$), and School Problems ($t = 8.12$; $d = 1.00$). Overall, only a few subdomains were not significantly different from norms; Aggression, Conduct Problems, Anxiety, Adaptability, and Social Skills.

Executive Functioning of Children with CHD Compared to Norms

To compare caregiver's perceptions of executive functioning abilities in the current sample to norms for a healthy sample, *t*-test analyses were conducted and revealed significant differences across all aspects of both the behavioral symptoms indices and metacognitive indices (Table 3). Per caregiver report, children and adolescents with CHD are perceived as having greater dysfunction in all domains of executive functioning abilities relative to healthy peers. Evaluation of the magnitude of these differences demonstrated medium to large effect sizes using Cohen's *d*, with greatest impairment in the metacognitive domains including; Initiate ($t = 9.32$; $d = 1.14$), Working Memory ($t = 13.71$; $d = 1.68$), Plan/Organization ($t = 10.51$; $d = 1.32$), Organization of Materials ($t = 6.63$; $d = .79$), and Monitor ($t = 8.71$; $d = 1.02$).

T-test analyses were also conducted to compare executive functioning abilities of children with CHD in the present sample compared to norms for a healthy sample using teacher report. Consistent with caregiver report, children with CHD were seen as having greater

dysfunction than healthy peers in all aspects of executive functioning (Table 4). Using Cohen's *d*, the magnitude of these differences was notable for all three composites; Behavior Regulation Index (t = 4.88; d = .70), Metacognition Index (t = 8.34; d = 1.16), and the Global Executive Composite (t = 7.58; d = 1.07). Significant differences for each of the subdomains of these indices fell within the range of medium to large effect size.

Prevalence of Children Meeting At-risk or Clinically Significant Psychosocial Difficulties

Using the parameters described above, scores on the BASC-2 were coded into three categories; at-risk/low, clinically significant, and the combination of those two groups. In normative samples, the expected percentages of children in these categories would be 13% for at-risk/low, 2% for clinically significant, and 15% for the combination. Obtained percentages/frequency of children within each category by reporter is presented in Table 5. Using Caregiver proxy-report, the following percentages of children were identified as having either at-risk/low or clinically significant, behavioral difficulties on composite scores; 28.2% (n = 20) for Externalizing Problems, 29.6% (n = 21) for Internalizing Problems, 42.3% (n = 30) for Behavioral Symptoms Index, and 55.0% (n = 39) for Adaptive Skills. As it would be expected for 15% of the sample to fall within either at-risk or clinically significant impairment categories, children in the present sample were 1.88, 1.97, 2.82, and 3.67 times more likely to be identified by their caregivers with notable impairment across each composite respectively. Within each composite, the subdomain with the highest percentage of endorsement included Hyperactivity (39.4%, n = 28), Somatization (33.8%, n = 24), Attention Problems (70.4%, n = 50), and Activities of Daily Living (56.3%, n = 40), respectively. Compared to norms, the percentage of children identified in either at-risk or clinically significant impairment categories by their caregivers were 2.62, 2.25, 4.69, and 3.75 times greater than the expected 15%. Caregivers

endorsed clinically significant concerns on at least one domain of functioning for 64.8% of children. Further, 91.6% of the sample had at-risk or clinically significant concerns on at least one domain based on caregiver report.

A similar presentation of difficulties were reported by teachers with the following percentages of children meeting at-risk/low or clinically significant impairment on composite scores; 26.8% (*n* = 19) for Externalizing Problems, 36.6% (*n* = 26) for Internalizing Problems, 32.4% (*n* = 23) for Behavioral Symptoms Index, and 39.4% (*n* = 28) for Adaptive Skills. Children in the present sample were 1.78, 2.44, 2.16, and 2.62 times more likely to be identified with at-risk or clinically significant impairment by their teachers across each composite respectively. Within each composite, the subdomains with the highest percentage of endorsement included Hyperactivity (35.2%, *n* = 25), Somatization (39.4%, *n* = 28), Attention Problems (52.1%, *n* = 37), and Study Skills (45.0%, *n* = 32), respectively. Compared to norms, the percentage of children identified in either at-risk or clinically significant impairment categories by their teachers were 2.34, 2.62, 3.47, and 3.00 times greater than the expected 15%. Teachers endorsed clinically significant concerns on at least one domain of functioning for 57.8% of children. Furthermore, 87.3% of the sample had at-risk or clinically significant concerns on at least one domain based on teacher report.

Prevalence of Children Meeting At-risk or Clinically Significant Executive Functioning Deficits

Percentages/frequency of children falling within the categories of at-risk (T-scores of 60-64) and clinically significant (T-scores $\geq$ 65) for each category per reporter is presented in Table 6. In normative samples, the expected percentages of children in these categories would be 10% for at-risk, 5% for clinically significant, and 15% for the combination. Using caregiver report,

between 33.9% and 71.8% of the children fell within the at-risk or clinically significant ranges on each domain or composite index of executive function. These include 40.9 % (*n* = 29) for the Behavior Regulation Index, 71.8% (*n* = 51) for the Metacognition Index, and 63.4 % (*n* = 45) for the Global Executive Composite. Compared to the expected 15%, children in the present sample were 2.72, 4.78, and 4.22 times more likely to fall in the at-risk or clinically significant range compared to norms, respectively. Notably, the largest number of children were identified as having difficulties on the Behavioral Regulation Index was on the dimension of Inhibit (43.7%; *n* = 31), and the greatest number having problems in the Metacognition Index was on the dimension of Working Memory (74.7%; *n* = 53). As it would be expected for 15% of the sample to fall within the at-risk or clinically significant range, children with complex CHD were 2.91 and 4.98 times more likely to be identified in those categories respectively. Caregivers endorsed clinically significant concerns on at least one subscale for 87.3% of the children. Further, the majority of caregivers (91.6%) endorsed behaviors in either the at-risk or clinically significant range on at least one subscale.

Evaluation of teacher report demonstrates a similar presentation with the following percentages of youth identified as having at-risk or clinically significant difficulties; 40.9 % (*n* = 29) for the Behavior Regulation Index, 57.8% *(n* = 41) for the Metacognition Index, and 56.3 % (*n* = 40) for the Global Executive Composite. Compared to the 15% of children expected to fall within either risk category, children in the present sample were 2.72, 3.85, and 3.75 times more likely to be identified with notable impairment for each respective domain. While teachers also endorsed Working Memory (69.0%; *n* = 49) as the subdomain with the largest percentage of children with observable deficits on the Metacognitive Index, Shift (39.5%; *n* = 28) was subdomain with the largest number of children with executive functioning deficits on the

Behavioral Regulation Index. The likelihood of a child in the present sample being identified as at-risk or clinically significant was 4.6 times greater for Working Memory and 2.63 times greater for Shift. Teachers endorsed clinically significant concerns on at least one domain for 73.2% of children in the present sample. Furthermore, 84.5% of children fell in either the at-risk or clinically significant range on at least one domain of executive functioning based on teacher report.

Agreement Between Caregiver and Teacher Report of Psychosocial Functioning

To evaluate the relationship between caregiver and teacher report of psychosocial functioning, paired sample *t*-tests were conducted and ICC's were used to determine convergence between reporters. Results are presented in Table 7. Attention Problems ($t = 2.72$, $p = .01$) was the only subdomain that significant differences between caregiver and teacher report emerged. All other subdomains and composite scores were not significantly different. Results revealed significant ICCs between caregiver and teacher report of psychosocial functioning, ranging from .55 to .75 for all subdomains and composite scores of psychosocial functioning suggesting general concordance between raters (Kottner et al., 2011).

Agreement Between Caregiver and Teacher Report of Executive Functioning

Caregiver and teacher report of executive functioning was compared using paired sample *t*-tests. Results are presented in Table 8. Differences between informants emerged on the Emotional Control ($t = 1.98$, $p = .05$) subscale, however paired sample *t*-tests were not significant for all other subdomains and composite scores of executive functioning. Results indicated significant ICCs between caregiver and teacher report of executive functioning, ranging from .48 to .63 for all subdomains and composite scores with the exception of one.

While differences between informants on the Organization of Materials subdomain were not found (t = -.39, p = .69), reporter's responses were not significantly associated (ICC = .22).

CHAPTER 4

DISCUSSION

The current study examined caregiver and teacher report of psychosocial and executive functioning in a sample of clinically-referred children with complex CHD. As hypothesized, both caregivers and teachers reported significantly greater impairment across all domains of executive functioning compared to norms, with greatest impairment observed in working memory. The effect sizes for most of the statistically significant comparisons were in the medium to large range. Both caregiver and teacher reports of executive functioning indicated that two to five times the number of participants in the at-risk and clinically significant ranges when compared to normative expectations (e.g., 15% of the original normative sample). Additionally, prior investigations utilizing a research-referred sample of children with varying levels of CHD complexity identified the percentage of children rated in the clinically significant range (≥ 1.5 SDs above the population mean) on at least one of the multiple domains of the BRIEF as 56.3% based on parent report and 57.1% based on teacher report (Cassidy et al., 2014). In the current study using clinically-referred children with complex CHD, 87.3% and 73.28% of children had at least one score in the clinically significant range based on parent and teacher report, respectively. Therefore, the present sample of clinically-referred children with complex CHD is experiencing greater executive functioning impairment when compared both to normative samples and to children with varying CHD complexity.

Caregiver and teacher report also indicated significantly greater impairment on most domains of psychosocial functioning compared to norms. For statistically significant

comparisons, effect sizes were generally in the small to large range for caregivers and in the medium to large range for teachers. As with executive functioning, caregiver and teacher report indicated that two to four times more children in this study experienced behavioral deficits in the at-risk or clinically significant range, relative to normative expectations. Taken together, results of this investigation demonstrate that the present sample of children with CHD experience significant impairment across multiple domains of functioning.

While deficits in psychosocial and executive functioning in children with CHD have been reported (Calderon et al., 2012; Karsdorp et al., 2007), this study expands the literature by detailing the unique behavioral impairments experienced by children with complex CHD who have been clinically-referred for assessment. Previously, parents of surgically treated children with CHD reported greater externalizing (15% of the sample) and internalizing behavior (16%) difficulties compared to peers, with small effect size differences for externalizing behaviors and medium effect size differences for internalizing behaviors (Karsdorp et al., 2007). The present study found twice the percentage of children experiencing difficulties in these domains of concern, again suggesting that clinically-referred children with complex CHD experience greater difficulties than both the general population and children with varying levels of CHD complexity. Additional findings from the present study also underscore a particular need to assess other behavioral symptoms, including difficulties with learning, school problems, and adaptive functioning skills, which have seldom been the focus of research for children with CHD. Given the broad impairment across domains that are reported by both caregivers and teachers, comprehensive intervention is appropriate for many of the children with complex CHD.

When examining agreement between reporters, caregivers and teachers endorsed similar levels of deficits for all areas of psychosocial functioning with the exception of attention

problems. Similarly, teachers and caregivers were consistent in their ratings of all domains of executive functioning except emotional control, with teachers endorsing greater deficits in emotional control. Agreement also was supported by ICCs, which indicated high concordance between reporters for all domains of psychosocial functioning. This was also true for executive functioning with the exception of organization of materials. Overall, for both psychosocial functioning and executive functioning, the pattern of results indicates high levels of agreement. While use of multiple informants is recommended to provide a comprehensive assessment of child behaviors across environments, the results of this investigation poses the question of whether unique information is obtained by using a second informant. There may be more value in obtaining information from a single reporter for more families than seeking input from two reporters for fewer families if the number of professionals who are able to administer, score, and interpret these assessments is limited. Given the variability in personnel resources across medical settings, consideration for refining the process for conducting assessments is warranted.

The American Heart Association's proposed guidelines and algorithm reflect medical and developmental considerations that classify children who may be more likely to experience neurocognitive deficits. The inclusion of brief behavioral assessment screening measures, such as were used in this study, may be a practical way to help identify those who would be most likely to benefit from further evaluation. Although the current study did not address whether clinical impairment on behavioral measures is related to broad cognitive impairment, as assessed by comprehensive neuropsychological testing, there is evidence supporting their validity. In a sample of children with surgically corrected CHD, parents' endorsement of greater attention and memory difficulties was predictive of worse neurodevelopmental performance on in-vivo assessment (Miatton et al., 2007). Future research should evaluate the association between

behavioral screening measures and the outcomes of comprehensive neuropsychological assessments, particularly for children with complex CHD.

The present study demonstrates the extent to which children with complex CHD, regardless of specific medical diagnosis, experience behavioral and executive functioning deficits that are apparent to both caregivers and teachers. While this study provides a novel contribution to existing literature, it is also not without limitations. Although reporters did not significantly differ across domains, it is possible that the nature of the referral process biased respondents to accentuate impairment, knowing that potential resources or accommodations may be made available as a result of the assessment. Second, child self-report was not included in this investigation. Future research should include child self-report measures to assess how all respondents may vary in their perceptions of behavior. Third, there were no external criteria, such as in vivo neuropsychological assessment results, by with to evaluate the predictive validity of the different reporters' assessments. Fourth, the assessments were conducted at one point in time. Longitudinal observation of executive functioning deficits in children (age 8) and later adolescents (age 16) showed that inhibition and task-switching skills appeared to decline (Bellinger et al., 2011). It is possible that follow-up of the present sample without intervention may show a similar increase in impairment. In addition, in future research longitudinal assessment of impairment by multiple reporters may demonstrate patterns of behavior that are uniquely reported according to the children's developmental level.

Children with CHD who have been clinically-referred given disease complexity and high risk status for neurocognitive impairment experience significant concerns for psychosocial and executive functioning deficits that are apparent across environments. While multiple informants may provide unique information on a case-by-case basis, overall both caregivers and teachers

endorsed similar rates of impairment with high levels of agreement between reporters. As a consequence, the necessity to obtain assessment information from multiple informants did not receive strong support. It is possible that cardiac neurodevelopmental clinics should consider the implications of the present study when allocating sparse resources. Additionally, the high rates difficulties that were endorsed in almost every domain of functioning strongly indicates the need for psychosocial intervention and support services for these children with complex CHD and their families.

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Table 1. Caregiver Report of Psychosocial Functioning Compared to Norms

BASC-2-PRS Domain	Mean *T* score	*SD*	*T* score range	Mean Difference (95% CI)	*t*	Cohen's d^a
Externalizing Problems	54.86	15.13	34-121	4.86 (1.28 to 8.44)	2.71**	.38
Hyperactivity	58.2	17.72	34-136	8.19 (4.00 to 12.39)	3.90**	.57
Aggression	51.68	13.46	36-115	1.68 (-1.51to 4.86)	1.05	.14
Conduct Problems	53.41	14.19	37-109	3.41 (.05 to 6.77)	2.02*	.28
Internalizing Problems	56.13	13.99	32-110	6.13 (2.82 to 9.44)	3.69**	.50
Anxiety	54.15	15.84	31-128	4.15 (.41 to 7.90)	2.21*	.31
Depression	55.59	13.56	37-116	5.59 (2.38 to 8.80)	3.48**	.47
Somatization	55.86	14.11	36-91	5.86 (2.52 to 9.20)	3.50**	.48
Behavioral Symptoms Index	58.93	13.09	36-113	8.93 (5.83 to 12.03)	5.75**	.76
Atypicality	57.55	13.74	41-115	7.55 (4.30 to 10.80)	4.63**	.63
Withdrawal	57.07	14.48	34-95	7.07 (3.64 to 10.50)	4.12**	.57
Attention Problems	63.77	11.35	37-104	13.78 (11.09 to 16.46)	10.23**	1.29
Adaptive Skills	42.87	14.57	20-119	-7.13 (-10.58 to -3.68)	-4.12**	.57
Adaptability	47.08	12.73	28-107	-2.92 (-5.93 to .10)	-1.93	.26
Social Skills	47.90	15.97	21-128	-2.10 (-5.88 to 1.68)	-1.11	.16
Leadership	43.44	15.48	18-124	-6.56 (-10.23 to -2.90)	-3.57**	.50
Activities of Daily Living	40.11	13.97	19-107	-9.89 (-13.19 to -6.58)	-5.96**	.81
Functional Communication	42.28	15.54	18-115	-7.72 (-11.40 to -4.04)	-4.19**	.59

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

[a]For Cohen's *d*, small effect size: $d = .20$, medium effect size: $d = .50$, large effect size: $d = .80$

Table 2. Teacher Report of Psychosocial Functioning Compared to Norms

BASC-2-TRS Domain	Mean *T* score	*SD*	*T* score range	Mean Difference (95% CI)	*t*	Cohen's *d*[a]
Externalizing Problems	52.96	12.93	40-108	2.96 (-.10 to 6.02)	1.92	.26
Hyperactivity	55.89	14.79	40-108	5.89 (2.39 to 9.39)	3.35**	.47
Aggression	51.37	12.99	42-117	1.37 (-1.71 to 4.44)	0.89	.12
Conduct Problems	51.21	11.05	41-95	1.221 (-1.40 to 3.83)	0.92	.11
Internalizing Problems	56.35	15.69	40-118	6.35 (2.64 to 10.06)	3.41**	.48
Anxiety	53.14	14.53	38-114	3.14 (-.30 to 6.58)	1.82	.25
Depression	54.61	16.52	42-129	4.61 (.70 to 8.52)	2.35*	.34
Somatization	57.79	15.57	42-103	7.79 (4.10 to 11.47)	4.22**	.60
Behavioral Symptoms Index	56.31	14.90	35-109	6.31 (2.78 to 9.84)	3.57**	.50
Atypicality	57.11	14.94	42-111	7.11 (3.58 to 10.65)	4.01**	.56
Withdrawal	55.18	13.81	38-97	5.18 (1.91 to 8.45)	3.16**	.43
Attention Problems	59.92	10.98	38-105	9.92 (7.32 to 12.51)	7.61**	.94
Learning Problems	59.55	12.33	39-98	9.55 (6.63 to 12.47)	6.52**	.85
School Problems	60.51	10.91	38-101	10.51 (7.93 to 13.09)	8.12**	1.00
Adaptive Skills	45.03	10.68	24-99	-4.97 (-7.50 to -2.44)	-3.92**	.48
Adaptability	49.21	10.81	22-87	-.79 (-3.35 to 1.77)	-0.62	.07
Social Skills	48.49	13.38	15-109	-1.51 (-4.68 to 1.66)	-0.95	.12
Leadership	44.58	10.52	19-95	-5.42 (-7.91 to -2.93)	-4.35**	.53
Study Skills	43.75	10.67	27-99	-6.25 (-8.78 to -3.73)	-4.94**	.60
Functional Communication	43.15	12.20	21-107	-6.85 (-9.73 to -3.96)	-4.73**	.61

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

[a]For Cohen's *d*, small effect size: $d = .20$, medium effect size: $d = .50$, large effect size: $d = .80$

Table 3. Caregiver Report of Executive Functioning Compared to Norms

BRIEF-PF Domain	Mean *T* score	*SD*	*T* score range	Mean Difference (95% CI)	*t*	Cohen's *d*[a]
Behavior Regulation Index	57.17	11.40	35-94	7.17 (4.47-9.87)	5.30**	.67
Inhibit	57.18	11.46	37-86	7.18 (4.47-9.90)	5.28**	.67
Shift	57.69	12.42	36-92	7.69 (4.75-10.63)	5.22**	.68
Emotional Control	54.14	11.44	36-85	4.14 (1.43-6.85)	3.05**	.39
Metacognition Index	64.85	10.01	37-83	14.85 (12.48-17.21)	12.50**	1.48
Initiate	61.85	10.72	40-86	11.85 (9.31-14.38)	9.32**	1.14
Working Memory	67.38	10.69	42-89	17.38 (14.85-19.91)	13.71**	1.68
Plan/Organize	64.03	11.25	33-87	14.03 (11.37-16.69)	10.51**	1.32
Organization of Materials	57.89	10.02	32-75	7.89 (5.51-10.26)	6.63**	.79
Monitor	60.13	9.79	37-78	10.13 (7.81-12.44)	8.71**	1.02
Global Executive Composite	62.73	9.98	35-83	12.73 (10.37-15.09)	10.75**	1.27

***p* <.01

[a]For Cohen's *d*, small effect size: *d* = .20, medium effect size: *d* = .50, large effect size: *d* =.80

Table 4. Teacher Report of Executive Functioning Compared to Norms

BRIEF-TF Domain	Mean *T* score	*SD*	*T* score range	Mean Difference (95% CI)	*t*	Cohen's *d*[a]
Behavior Regulation Index	59.80	16.94	41-106	9.80 (5.79-13.81)	4.88**	.70
Inhibit	59.21	17.56	36-124	9.21 (5.06-13.37)	4.42**	.65
Shift	59.58	16.24	42-105	9.58 (5.73-13.42)	4.97**	.71
Emotional Control	58.1	17.35	43-109	8.10 (3.99-12.20)	3.93**	.57
Metacognition Index	64.61	14.76	39-106	14.61 (11.11-18.10)	8.34**	1.16
Initiate	64.45	14.42	39-96	14.45 (11.04-17.86)	8.45**	1.16
Working Memory	68.30	15.34	38-109	18.30 (14.66-21.93)	10.05**	1.4
Plan/Organize	62.59	13.60	40-103	12.59 (9.37-15.81)	7.80**	1.05
Organization of Materials	58.69	15.66	42-117	8.69 (4.98-12.40)	4.68**	.66
Monitor	61.65	14.83	40-105	11.65 (8.14-15.16)	6.62**	.92
Global Executive Composite	64.04	15.62	40-110	14.04 (10.35-17.74)	7.58**	1.07

***p* <.01

[a]For Cohen's *d*, small effect size: *d* = .20, medium effect size: *d* = .50, large effect size: *d* =.80

Table 5. Prevalence of Children Meeting At-risk or Clinically Significant Psychosocial Difficulties

	Caregiver[a]						Teacher[b]					
Domain	% at-risk	n	% clinically significant	n	% combined	n	% at-risk	n	% clinically significant	n	% combined	n
Externalizing Problems	19.7	14	8.5	6	28.2	20	16.9	12	9.9	7	26.8	19
Hyperactivity	22.5	16	16.9	12	39.4	28	18.3	13	16.9	12	35.2	25
Aggression	7.0	5	9.9	7	16.9	13	12.7	9	7.0	5	19.7	14
Conduct Problems	11.3	8	9.9	7	21.2	15	15.5	11	5.6	4	21.2	15
Internalizing Problems	14.1	10	15.5	11	29.6	21	21.1	15	15.5	11	36.6	26
Anxiety	16.9	12	12.7	9	29.6	21	9.9	7	11.3	8	21.2	15
Depression	25.4	18	7.0	5	32.4	23	8.5	6	11.3	8	19.7	14
Somatization	15.5	11	18.3	13	33.8	24	19.7	14	19.7	14	39.4	28
Behavioral Symptoms Index	28.2	20	14.1	10	42.3	30	21.1	15	11.3	8	32.4	23
Atypicality	22.5	16	15.5	11	38.0	27	14.1	10	18.3	13	32.4	23
Withdrawal	14.1	10	22.5	16	36.6	26	16.9	12	11.3	8	28.2	20
Attention Problems	46.5	33	23.9	17	70.4	50	35.2	25	16.9	12	52.1	37
Learning Problems	--	--	--	--	--	--	26.8	19	19.7	14	46.5	33
School Problems	--	--	--	--	--	--	26.8	19	21.1	15	47.9	34
Adaptive Skills	46.5	33	8.5	6	55.0	39	36.6	26	2.8	2	39.4	28
Adaptability	36.6	26	1.4	1	38.0	27	16.9	12	4.2	3	39.4	15
Social Skills	26.8	19	5.6	4	32.4	23	19.7	14	5.6	4	25.3	18
Leadership	35.2	25	11.3	8	46.5	33	39.4	28	1.4	1	40.8	29
Activities of Daily Living	36.6	26	19.7	14	56.3	40	--	--	--	--	--	--
Study Skills	--	--	--	--	--	--	39.4	28	5.6	4	45.0	32
Functional Communication	32.4	23	19.7	14	52.1	37	31.0	22	8.5	6	39.4	28

[a]BASC-2-PRS; [b] BASC-2-T

Table 6. Prevalence of Children Meeting At-risk or Clinically Significant Executive Functioning Difficulties

	Caregiver[a]						Teacher[b]					
Domain	% at-risk	*n*	% clinically significant	*n*	% combined	*n*	% at-risk	*n*	% clinically significant	*n*	% combined	*n*
Behavior Regulation Index	14.1	10	26.8	19	40.9	29	9.9	7	31.0	22	40.9	29
Inhibit	15.5	11	28.2	20	43.7	31	7.0	5	29.6	21	36.6	26
Shift	15.5	11	26.8	19	42.3	30	8.5	6	31.0	22	39.5	28
Emotional Control	8.5	6	25.4	18	33.9	24	7.0	5	28.2	20	35.2	25
Metacognition Index	21.1	15	50.7	36	71.8	51	12.7	9	45.1	32	57.8	41
Initiate	14.1	10	40.8	29	54.9	39	12.7	9	49.3	35	62.0	44
Working Memory	8.5	6	66.2	47	74.7	53	15.5	11	53.5	38	69.0	49
Plan/Organize	12.7	9	52.1	37	64.8	46	16.9	12	39.4	28	56.3	40
Organization of Materials	15.5	11	29.6	21	45.1	32	8.5	6	25.4	18	33.9	24
Monitor	19.7	14	31.0	22	50.7	36	9.9	7	32.4	23	42.3	30
Global Executive Composite	16.9	12	46.5	33	63.4	45	19.7	14	36.6	26	56.3	40

[a]BRIEF-PF; [b]BRIEF-TF

Table 7. Comparison of Caregiver and Teacher Report of Psychosocial Functioning

	Caregiver[a]		Teacher[b]					
Domain	*M*	*SD*	*M*	*SD*	*Mean difference (95% CI)*	*t*	Cohen's *d*[c]	*ICC*[d]
Externalizing Problems	54.86	15.13	52.96	12.93	1.90 (-1.32 to 5.12)	1.18	.13	.70**
Hyperactivity	58.20	17.72	55.89	14.79	2.31 (-1.15 to 5.77)	1.33	.14	.75**
Aggression	51.68	13.46	51.37	12.99	.31 (-2.84 to 3.46)	.20	.02	.66**
Conduct Problems	53.41	14.19	51.21	11.05	2.20 (-.88 to 5.28)	1.42	.17	.65**
Internalizing Problems	56.13	13.99	56.35	15.69	-.23 (-4.04 to 3.59)	-.12	-.01	.58**
Anxiety	54.15	15.84	53.14	14.53	1.01 (-2.89 to 4.92)	.52	.06	.58**
Depression	55.59	13.56	54.61	16.52	.99 (-2.97 to 4.94)	.50	.06	.56**
Somatization	55.86	14.11	57.79	15.57	-1.93 (-5.72 to 1.86)	-1.01	-.13	.59**
Behavioral Symptoms Index	58.93	13.09	56.31	14.90	2.62 (-.98 to 6.22)	1.45	.18	.58**
Atypicality	57.55	13.74	57.11	14.94	.47 (-3.22 to 4.09)	.24	.03	.59**
Withdrawal	57.07	14.48	55.18	13.81	1.89 (-1.84 to 5.62)	1.01	.13	.55**
Attention Problems	63.77	11.35	59.92	10.98	3.86 (1.03 to 6.69)	2.72**	.34	.60**
Adaptive Skills	42.87	14.57	45.03	10.68	-2.16 (-5.00 to .69)	-1.51	-.17	.72**
Adaptability	47.08	12.73	49.21	10.81	-2.13 (-5.06 to .81)	-1.45	-.18	.62**
Social Skills	47.90	15.97	48.49	13.38	-.59 (-4.12 to 2.93)	-.34	-.04	.66**
Leadership	43.44	15.48	44.58	10.52	-1.14 (-4.37 to 2.09)	-.71	-.09	.64**
Functional Communication	42.28	15.54	43.15	12.20	-.87 (-3.99 to 2.24)	-.56	-.06	.72**

**p <.01

[a]BASC-2-PRS; [b]BASC-2-TRS; [c]For Cohen's *d*, small effect size: d = .20, medium effect size: d = .50, large effect size: d =.80; [d]ICC, poor ≤.40, fair .40-.59, good .60 to .74, excellent .75 to 1.0

Table 8. Comparison of Caregiver and Teacher Report of Executive Functioning

	Caregiver[a]		Teacher[b]					
Domain	*M*	*SD*	*M*	*SD*	*Mean difference (95% CI)*	*t*	Cohen's *d*[c]	*ICC*[d]
Behavior Regulation Index	57.17	11.40	59.80	16.94	-2.63 (-6.22 to .95)	-1.46	-.18	.62**
Inhibit	57.18	11.46	59.21	17.56	-2.03 (-5.67 to 1.62)	-1.1	-.14	.63**
Shift	57.69	12.42	59.58	16.24	-1.89 (-5.50 to 1.72)	-1.04	-.13	.62**
Emotional Control	54.14	11.44	58.10	17.35	-3.96 (-7.94 to .02)	-1.98*	-.27	.51**
Metacognition Index	64.85	10.01	64.61	14.76	.24 (-3.17 to 3.65)	.14	.02	.51**
Initiate	61.85	10.72	64.45	14.42	-2.60 (-6.12 to .91)	-1.48	-.20	.48**
Working Memory	67.38	10.69	68.30	15.34	-.92 (-4.53 to 2.70)	-.51	-.07	.50**
Plan/Organize	64.03	11.25	62.59	13.60	1.44 (-1.89 to 4.76)	.86	.11	.54**
Organization of Materials	57.89	10.02	58.69	15.66	-.80 (-4.93 to 3.32)	-.39	-.06	.22
Monitor	60.13	9.79	61.65	14.83	-1.52 (-4.87 to 1.83)	-.91	-.12	.54**
Global Executive Composite	62.73	9.98	64.04	15.62	-1.31 (-4.66 to 2.04)	-.78	-.09	.59**

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

[a]BRIEF-PF; [b]BRIEF-TF; [c]For Cohen's *d*, small effect size: $d = .20$, medium effect size: $d = .50$, large effect size: $d = .80$; [d]ICC, poor ≤.40, fair .40-.59, good .60 to .74, excellent .75 to 1.0