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EXAMINING EXECUTIVE FUNCTIONING IN CHILDREN WITH  
EXTERNALIZING AND INTERNALIZING BEHAVIORS  
USING THE BRIEF2

by

Kristin Rachelle Streich, S.S.P.

DISSERTATION

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## **Dedication**

This dissertation project is dedicated to the people in my life who matter most. First, to my mentor and friend, Dr. Gail Cheramie, whose wisdom and grace inspire me every day. To my husband, Stephen Streich, who is my strength, my dearest friend, and the impetus for all I do. To my children, Jacob and Lillianna, you are my heart and I am so very glad you were born. To my mother, Dr. Charlotte Rhyne, who is the true trailblazer for the women in our family. Finally, to my father, Ronald Rhyne, who worked tirelessly and selflessly for many years to ensure I received the best education possible.

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ABSTRACT

EXAMINING EXECUTIVE FUNCTIONING IN CHILDREN WITH  
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University of Houston-Clear Lake, 2019

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Many children struggle with externalizing and internalizing behaviors, with some reaching diagnosable levels. Research has suggested these children also have significant difficulty with executive functioning. The BRIEF is a behavior observation narrowband rating scale that is frequently used to identify executive dysfunction in children. However, with the new standardization of the BRIEF2, there is no research to date that uses this measure to identify executive dysfunction in children with externalizing and internalizing behaviors. The purpose of this study was to examine the use of the BRIEF2 teacher form for investigating the relation between externalizing and internalizing behaviors and executive functioning. Standardization data provided by the authors of the BRIEF2 were used for this study. Teachers of the subjects provided data regarding the subjects' externalizing and internalizing behaviors using the BASC-2, as well as the

subjects' executive functioning abilities using the BRIEF2. Increases in domains of executive functioning were found to be significantly associated with behavior. Given that externalizing and internalizing behaviors are related to executive functioning, the current study provided further evidence that this relation is important, and the BRIEF2 may be considered an appropriate measure for this purpose.

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CHAPTER I:  
INTRODUCTION

**Externalizing and Internalizing Behaviors**

**Externalizing Behaviors**

Many children struggle with regulating their behavior, and these behaviors are generally divided into two broad categories, externalizing and internalizing (Achenbach, 1982; Gage, 2013; Kauffman & Landrum, 2012). Children with externalizing behaviors (EB) often have trouble regulating their behavior, which can present in multiple ways (Barkley, 2012; Carlisi et al., 2017; Gioia, Isquith, & Guy, 2001; Klassen, Katzman, & Chokka, 2010; Mattison, 2015; Morgan & Lilienfeld, 2000; Oosterlaan, Scheres, & Sergeant, 2005). They may have deficits in impulse control, stopping inappropriate behaviors (inhibition), and monitoring the effects of their own behavior on others (self-monitoring; Gioia et al., 2016). More specifically, children with EB may engage in verbal/physical aggression toward others (Barkley, 2015; Bradley et al., 2008; Coutinho & Oswald, 2005; Cruz, 2006; Cullinan & Sabornie, 2004; Feifer & Rattan, 2007; Gioia & Isquith, 2002). They may engage in defiant or aggressive behaviors either without thinking through the consequences of their actions or realizing the effect their behavior has on others.

Overall, all children exhibit a degree of EB, and the amount of struggle is based on several variables, including age, gender, and development level. For example, it is developmentally normal for a child to display more externalizing behaviors at a younger age, and as they develop those behaviors decrease (Schoemaker, Mulder, Deković, & Matthys, 2013). There is clear evidence that in typically developing children, there is a negative relation with increasing age and EB (Schoemaker et al., 2013). More specifically, the younger the child, the more the child exhibits EB (Schoemaker et al.,

2013). The literature also suggests that boys exhibit EB more often than girls (Urazán-Torres et al., 2013).

Outside of typical development, for some individuals EB may progress to problematic, clinical levels. When the EB reach clinical levels, this may result in disruption, non-compliance, impulsivity, and hyperactivity. More specifically, children with clinically problematic levels of EB (such as those with Attention-Deficit/Hyperactivity Disorder [ADHD] and behavioral disorder diagnoses) experience poor relationships and academic failure (Achenbach, 1982; Gage, 2013; Gresham & Kern, 2004; Harrington & Maskey, 2008; Kendiziora, 2004; Morris et al., 2002). Also, this population shows significant deficit in communication skills, which can exacerbate the difficulties they experience, as language is a moderator to their behaviors (Urazán-Torres, Puche-Cabrera, Caballero-Forero, & Rey-Anacona, 2013).

Outside of the effects on functioning level, research also suggests that children with EB have trouble with self-regulation, such as lack of inhibition, cognitive flexibility, and working memory (Alderson, Rapport, & Kofler, 2007; Pennington & Ozonoff, 1996; Wilcutt, Doyle, Nigg, Faraone, & Pennington, 2005). This is true for those that struggle with EB and for those at diagnosable levels of EB disorders. A recent study indicated that children with EB (with and without ADHD) experienced significant difficulty when required to change problem-solving techniques or switch from preferred to non-preferred tasks (Schoemaker et al., 2013).

Regarding academic performance, difficulties can be seen in general classroom skills (e.g., organization, completing tasks, problem solving) and specific academic-related skills (e.g., written expression). However, it should be noted that academic difficulties of children who exhibit sub-clinical and diagnosed levels of EB are often overlooked because of the severity of the disruptive behaviors in their daily environments

(Bjorker, 2001; Sinco, 2009). They are frequently behind their peers in rate of academic development and academic self-efficacy (Hughes & Ensor, 2011). Studies have examined specific academic-related difficulties experienced by this population. For example, Reid et al. (2000) found that students with EB showed significant academic underachievement. Further, students with EB have shown deficits with verbal fluency and spatial skills, and male students with EB have more pronounced deficits in verbal flexibility. Additionally, female students with EB have more intact linguistic skills, but greater difficulty with problem solving (Urazán-Torres et al., 2013). These difficulties may cumulatively impact the academic performance of a child with EB.

### **Internalizing Behaviors**

Internalizing behaviors (IB) are behaviors directed inwardly toward the self (e.g., depressive and anxious behaviors). Children with IB exhibit behavioral difficulties as well. Such behaviors are their ability to inhibit impulsive behaviors (inhibition) and monitoring their level of attending (self-monitoring) with peers and in school (Hollocks et al., 2014). More specifically, when a child with IB is more inwardly focused, they may tend more to their thoughts and feelings than to the requirements of the environment around them.

Like EB, most children exhibit IB to some degree. Children may worry when they are away from their primary caretakers, or experience sadness when preferred items or environments are removed. Further, adolescents may experience anxiety when performing in front of peers, or sadness with the ending of a relationship. Research suggests a positive relation between age and IB. More specifically, older children are likely to experience more IB than younger children (Ghassabian et al., 2014). This is likely due to their experiencing more stressful situations as they age (Rudolph, 2002). Research also indicates girls are more prone to experience IB than boys. This may be

related to gender differences in relationships. For example, girls put greater importance on social connectedness and affiliation than boys (Rose & Rudolph, 2006). As such, peer stress exposure may threaten girls' perception of self-worth possibly leading to more intense negative self-evaluation, hopelessness, and subsequent depression (Rudolph, 2009).

Outside of typical development, for some individuals IB can increase to clinical levels of dysfunction, such as with depression and anxiety-related disorders. They may experience a reduced ability to think about topics other than their negative emotions, which prevents appropriately dealing with stress (Agoston & Rudolph, 2016). They may also have difficulty thinking through steps for the best course of action to reduce the impact of stress and behave in ways that alienate others such as with excessive reassurance seeking (Prinstein, Borelli, Cheah, Simon, & Aikins, 2005).

Youth who exhibit IB, including those with diagnosable levels, may also have emotional difficulties. Studies have shown children with IB have more difficulty with being flexible in situations (shifting; Ghassabian et al., 2014; Wagner, Müller, Helmreich, Huss, & Tadić, 2015). They may become emotional when asked to problem solve, when confronted with stressful social situations, during challenging academic tasks, or when asked to transition from a desired task to an undesired task. Moreover, children with IB may have difficulty regulating their emotions (emotional control; Bunford, Evans, Becker, & Langberg, 2015). They may appear emotionally labile, have emotional "meltdowns," or have episodic rage (Gioia, Isquith, Guy, & Kenworthy, 2016). More specifically, children with IB are often unable to regulate their emotional distress, leaving them with a diminished capacity to cope and function.

Regarding the impact of IB on school performance, children with IB may also have academic difficulties. Children with IB have a high rate of academic difficulties due

to factors such as excessive absences, performance anxiety, and lack of engagement (Gage, 2013). Children with IB may be less likely to be academically engaged in class compared to their peers (Owens, Stevenson, Hadwin, & Norgate, 2012). Results from multiple studies indicate that children with IB typically performed significantly lower than peers in reading, math, and written expression (Eysenck, Payne, & Derakshan, 2005; Owens, Stevenson, Hadwin, & Norgate, 2012). Further, IB have been negatively correlated with coursework grades and examination performance (Derakshan & Eysenck, 2009; Keogh, Bond, French, Richards, & Davis, 2004; Putwain, Connors, & Symes, 2010).

Dysregulation and lack of coping sometimes experienced by children with IB interferes with their educational functioning. For example, these children may withdraw from academic and school-related activities, as manipulating the multiple task and social stimuli can become overwhelming (Wilson, Smith, & Holmes, 2007). Further, difficulty with social interactions may also lead to lack of participation during small-group activities or self-imposed social isolation (e.g., sitting alone during lunch, unwillingness to work in groups during electives, or avoiding school-sponsored groups or functions; Gage, 2013).

### **Executive Functioning**

When examining the difficulties seen in children with EB or IB, it appears that both groups may have behavioral, emotional and academic difficulties. However, other factors may influence EB and IB. One of those factors may be executive functioning (EF).

### **Defining Executive Functioning**

EF is a broad term used to describe a multi-dimensional construct that includes a collection of inter-related functions responsible for guiding, managing, and directing

one's thoughts, feelings, and actions (Barkley, 2012; Diamond, 2013; Gioia et al., 2016). Historically, the definition of EF has been a topic of much debate (Barkley, 2012; McGlamery, Ball, Henley, & Besozzi, 2007; Welsch, 2002). For example, Luria (1973, 1980) described EF as a comprehensive term for multiple mental processes that jointly facilitate, monitor, and control other cognitive functions. Additionally, other researchers endorse the addition of self-control in the domains of emotions and behavior within the definition of EF (Baddeley, 1986; Denckla, 1996; Stuss & Benson, 1986; Welsh & Pennington, 1988). Further, authors are not in complete agreement regarding the total number of EF areas within their definitions. For example, some limit the number of possible executive functions to five (Barkley, 2012), while others include the possibility of up to 40 distinct executive functions within their definition (McCloskey & Perkins, 2013).

However, more recently, many theorists have agreed upon the model of EF that was developed by Gioia, Isquith, Guy, and Kenworthy (2000, 2016). This model states that EF can be defined as a collection of multi-dimensional, inter-related areas of cognitive processes. These processes guide, oversee, and manage one's cognitive, emotional, and behavioral functioning. Over the course of several years, Gioia, Isquith, Guy, and Kenworthy finalized their theory to include nine different types of EF that are assigned into three distinct categories. These three categories include behavior regulation, emotion regulation, and cognitive regulation.

The behavior regulation component represents one's ability to effectively regulate and monitor one's behaviors. It is comprised of inhibition and self-monitoring. Inhibition describes the ability to control one's impulses by appropriately stopping behavior at the proper time, and self-monitoring allows for keeping track of the effect one's behavior has on others. Appropriate regulation of one's behavior leads to appropriate regulation of



one's thoughts (i.e., cognitions). This regulation of thoughts then allows one to problem solve and self-regulate (Gioia et al., 2016).

The emotion regulation component represents the ability to regulate one's emotional responses including responses to changing situations. Shifting and emotional control are within this category. Shifting is the ability to transition flexibly from one situation to another and solve problems with flexibility. Emotional control is the ability to appropriately modulate one's emotional responses (Gioia et al., 2016).

Finally, the cognitive regulation component represents one's ability to control and manage thought processes and effectively solve problems. It is comprised of initiation, working memory, planning and organizing, task-monitoring, and organization of materials. Initiation is the ability to begin a task or activity and independently produce ideas. Working memory is one's ability to hold information in mind to complete a task or stay with an activity. Planning and organizing represents one's ability to anticipate future events, set goals, and develop necessary steps before they are needed to carry out a related task or action. Planning and organizing also involves carrying out tasks systematically and understanding and communicating main ideas or critical thoughts. Task-monitoring represents one's ability to check one's work and evaluate one's performance during or after finishing a task to ensure accomplishment of the task's goal. Organization of materials represents one's ability to maintain order in one's work, leisure areas, and materials. Being able to appropriately regulate one's thoughts is needed to engage in multi-step problem solving, learning and recalling complex information, and deliberate, appropriate application of one's knowledge (Gioia et al., 2016).

As stated above, both behavior and emotion regulation are necessary for regulating one's cognitions. When one shows deficits in one's ability to regulate behaviors and emotions, one's ability to govern and guide higher-level cognitive

processes, such as those needed for academic success, is lacking. Therefore, EF enables the maintenance of optimal levels of cognitive, emotional, and behavioral functioning (Barkley, 2012; Eisenberg, Hofer, & Vaughan, 2007; Jacobson, Pritchard, Koriakin, Jones, & Mahone, 2016; McCloskey, Perkins, & Van Divner, 2009). More specifically, intact EF is imperative for successful life functioning, so optimal functioning in these areas of EF is needed for successful academic performance.

### **Problems Associated with Executive Dysfunction**

Problems with EF may result in difficulties in several areas for children, including behavioral, emotional, and academic functioning. Just like relation between EF and functioning problems, these same problems can extend to externalizing and internalizing behaviors. More specifically, research supports the association between level of executive dysfunction and level of EB or IB (Johnson, Kemp, Heard, Lennings, & Hickie, 2015; Miyake, Emerson, & Friedman, 2000; Visu-Petra, Miclea, & Visu-Petra, 2013; Wiebe et al., 2011). These results are similar across typical levels of EB and IB, and clinically significant levels, such as in children with diagnoses (i.e., ADHD, depression, anxiety; Jacobson, Pritchard, Koriakin, Jones, & Mahone, 2016; Pennington & Ozonoff, 1996). It has been suggested that the more a child struggles with EB or IB the more difficulty they may have with EF areas of behavior, emotion, and cognitive regulation (Gioia et al., 2016).

### **Behavior Regulation and Externalizing Behaviors**

Studies have indicated EF behavior regulation difficulties in children with typical and diagnosed levels of EB (Barkley, 2012; Carlisi et al., 2017; Gioia et al., 2001; Klassen et al., 2010; Mattison, 2015; Morgan & Lilienfeld, 2000; Oosterlaan et al., 2005). Children with EB may have deficits in their ability to control their impulses or stop inappropriate behaviors (inhibition). They may impulsively engage in distracting

behaviors such as calling out in class or making distracting noises. Additionally, a study using the BRIEF2 suggested children with EB have difficulty monitoring the effects of their behavior on others (self-monitoring; Gioia et al., 2016). More specifically, these children simply may not recognize the effect their EB have on others' perceptions of and reactions toward them.

### **Emotion Regulation and Externalizing Behaviors**

Children with typical and diagnosable levels of EB may also experience emotional dysregulation related to EF. Children with emotional dysregulation and EB may engage in verbal/physical aggression toward others (Barkley, 2015; Bradley et al., 2008; Coutinho & Oswald, 2005; Cruz, 2006; Cullinan & Sabornie, 2004; Feifer & Rattan, 2007; Gioia & Isquith, 2002). They may call other children names, verbally harass others, tantrum, engage in defiance and non-compliance, or engage in physical assault without thinking through the consequences of their actions (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Cruz, 2006).

### **Cognitive Regulation and Externalizing Behaviors**

Those with EB have been shown to exhibit cognitive dysregulation related to EF in both typically developing and diagnosable levels. They may struggle academically due to dysregulation with working memory (Huang-Pollock, Shapiro, Galloway-Long, & Weigard, 2017). For example, these children may have difficulty in math due to the need to maintain math information in the forefront of the brain and manipulate that information to solve problems. Additionally, children with EB have been shown to have difficulty with planning problem-solving approaches (Sulik & Obradović, 2017). Such difficulties may impact their performance in written expression (Greenbaum et al., 1996; Gresham, Lane, MacMillan, & Bocian, 1999). For example, writing calls for planning a topic and approach to express thoughts in an organized manner (problem-solving).

## **Behavior Regulation and Internalizing Behaviors**

Executive dysfunction is also found in children with IB. However, more research is needed regarding behavior regulation and IB, as most current research relates to emotion and cognitive regulation and IB. It is important to note that some children with sub-clinical and diagnosable levels of IB may experience behavior dysregulation, when they have reached the limit of their ability to maintain composure under stress. These children's IB may turn into brief outbursts such as tantrums or raging behaviors, when these children are pushed beyond their limit of coping (Gage, 2013; White, McDermott, Degnan, Henderson, & Fox, 2011).

## **Emotion Regulation and Internalizing Behaviors**

Research suggests a relation between emotion regulation and IB (Gioia et al., 2016). However, the research can be confusing because the scales of EF represent the very problems that children with IB may have. However, it is important to note that on EF narrowband measures, the scales of emotion regulation represent one's ability to regulate or control emotions, not the presence of the emotions themselves. If a child has IB, they also likely have difficulties with emotion regulation. Although the research is still lacking in differentiating between the two areas, current research does support the presence of emotional dysregulation in children with IB (Barkley, 2001; Klassen et al., 2010).

Children with sub-clinical and diagnosable levels of IB may have difficulty regulating their emotions during transitions (shifting). They may become frustrated when asked to transition from preferred to non-preferred tasks or activities. Additionally, they may demonstrate difficulty with adjusting problem-solving techniques to fit different situations (Gioia et al., 2016). Instead, they may choose to apply the same problem-solving approach to multiple social and task-related situations regardless of the

effectiveness of the chosen technique (shifting). Moreover, children with IB may also have difficulty modulating emotional responses when stressed (emotional control; Gioia et al., 2016). They may become more overwhelmed than the situation warrants. Such overwhelmed behaviors may lead to EB in these typically internalizing children (Gage, 2013; White et al., 2011).

### **Cognitive Regulation and Internalizing Behaviors**

Children with sub-clinical and diagnosable levels of IB may also have deficits related to cognitive regulation, such as working memory. More specifically, they may have difficulty regulating emotional responses for successful engagement in tasks requiring working memory (Pennington & Ozonoff, 1996). Additionally, children with IB have been shown to have deficits in tasks requiring planning and organization due to ruminating on the past or perseverating on a possible future. This may result in impulsivity and careless or hasty work completion (Andreotti et al., 2013; Gioia et al., 2002). Such cognitive regulation abilities are critical for academic success. Thus, these problems with EF may lead to lower overall functioning and subsequently poorer academic performance (Baddeley, 2013; Gage, 2013; Ghassabian et al., 2014).

### **Need for Targeted Academic Interventions: Implications**

Although IB and EB may affect functioning across a variety of settings and situations, one area that may be particularly problematic is the academic setting. Addressing academic functioning is important as such functioning is often not the primary target of interventions when a child is treated for clinical levels of EB or IB. Further, even if behaviors are not at clinical levels, these children will also suffer academically (Sinco, 2009).

Overall, most EF research indicates that EF skills are related to academic performance. In fact, executive dysfunction in students may affect a variety of skills and

lead to poor educational performance (Dawson & Guare, 2010). This dysfunction may also increase as the child ages (Davidson et al., 2006). Additionally, educational requirements for independent problem solving also increase as the student advances grade levels. For example, after primary grades, students are tasked with long-term, multi-step assignments in many content areas. Further, they often have different teachers for each content area requiring navigation of multiple classroom cultures and expectations. With these increasing demands, students rely more heavily on EF to meet the task requirements (Skolnik, 2016). When the student's EF is not as developed as their peers', students with executive dysfunction experience more academic failure (Cruz, 2006; Gioia et al., 2001). For example, these students may appear "lazy" in that they do not begin assignments or complain they do not know what to do to complete assignments. This may result in behavioral outbursts for those with EB or putting one's head down and refusing to work on the task for those with IB. Additionally, the degree of EF deficit appears to correlate with the degree of impairment in academic functioning (Barkley, 2012; Diamond, 2013; Gioia et al., 2000b; Isquith, Gioia, Guy, & Kenworthy, 2017; McCloskey, Gilmartin, & Stanco Vitanza, 2014; White, Jarrett, & Ollendick, 2013). As such, the greater the amount and depth of EF deficits children experience, the greater their academic failure.

Given the effect EF has on academic performance, it is not surprising that difficulties with EF can affect a student's academic performance. In fact, approximately 10% of children experience difficulties with EF; yet, many of these children do not require formal behavioral or academic support (Skolnik, 2016). However, there are children with more intense executive dysfunction who struggle immensely in the classroom, and they often require Special Education supports. Beyond the frequency of

problems with EF, it also appears that children with EF difficulties may have difficulty in many areas, including cognitive, emotion, and behavior regulation (Gioia et al., 2016).

Overall, deficits in EF affect children's cognitive regulation across multiple content areas. Researchers have studied the relationship between poor academic performance and EB and IB since the 1920s. Currently, researchers have begun to focus their studies on possible mediators between poor academic performance and EB and IB (Blanchard, 1928; Coutinho, 1986). The mediators include learning new activities/generating ideas, problem solving, planning, sequencing, prioritizing, and organizing, and each of these skills affect academic abilities. Children may have difficulty beginning tasks and assignments (initiation), shifting between activities easily and coping with unforeseen changes (shifting), or failing to check one's work to ensure completion of each step of a task or assignment (self-monitoring; McCloskey et al., 2014; Packer & Pruitt, 2010). They may have difficulty attending to tasks over long periods of time (inhibition), attending to multiple items at once, or performing well when presented with many details (working memory). They may also develop problems with changing activities or locations, adjusting problem-solving strategies to meet new task demands (shifting), or monitoring the passing of time when planning and organizing tasks (Flanagan, Ortiz, & Alfonso, 2013; McCloskey et al., 2014).

Additionally, executive dysfunction affects students' cognitive skills in specific content areas. Regarding reading, children with executive dysfunction may demonstrate problems in telling a story chronologically, extracting the main idea and other important information from texts, and drawing inferences from texts (Mascolo, Alfonso, & Flanagan, 2014). In math, children with deficits in EF may demonstrate difficulties with remembering the order of operations, identifying important information when solving word problems, or attending to operation signs on a work page (Mascolo et al.). In

writing, these children may have difficulty generating ideas and sequencing or prioritizing main events in narratives (Mascolo et al.).

### **Current Research on the Issue**

#### **Lack of Specific Measure and Problematic Measures**

Current research supports the relation between EF and both EB and IB. Research has linked EF to changes in behavior over time (Sulik et al., 2015). To determine which aspects of EF are problematic, one must identify a child's EF strengths and weaknesses. To identify child's EF strengths and weaknesses, assessment usually includes performance-based and behavior-based measures. Performance-based measures are commonly used in neuropsychological assessment for clinic-based diagnostic purposes. These measures allow psychologists to investigate specific neuropsychological deficits often resulting from traumatic brain injury or medical disorders. In general, there are several well-developed and psychometrically sound performance-based measures. These include the Wisconsin Card Sorting Test (Heaton, Chelune, Talley, Kay, & Curtiss, 1993), the NEPSY-II (Korkman, Kirk, & Kemp, 2007), the Wechsler Memory Scale--Fourth Edition (Wechsler, 2009), and the Delis-Kaplan Executive Functions System (D-KEFS; Delis, Kaplan, & Kramer, 2001).

These tests are effective with measuring specific EF capacities within the context of the individual test's structured conditions (e.g., the measure's symbol systems, one-on-one assessment). However, due to narrow context, such performance-based measures often do not address the *application* of EF to one's development of academic skills within a social environment such as the classroom (McCloskey, Perkins, & Van Diviner, 2009). In fact, research suggests that performance-based measures may be difficult to administer, that reliability estimates of individual sub-tests may be low, and that performance-based measures consider EF capabilities solely within structured situations



(Shunk, Davis, & Dean, 2006). With such narrow context for interpretation, performance-based measures alone are likely not sufficiently comprehensive for measuring neuropsychological functions that are behaviorally expressed and environmentally dependent (Sinco, 2009). Therefore, they may not be generalizable to a child's functioning within the educational environment. Additionally, it may be challenging to effectively identify how a child's performance on a performance-based measure directly relates to the child's functioning within the classroom without also incorporating EF behavior rating scales.

Behavior-based measures identify a child's level of EF across a variety of domains. Broadband instruments include the Behavior Assessment System for Children--Third Edition (BASC-3; Kamphaus & Reynolds, 2015), and the Child Behavior Checklist (CBCL; Achenbach, 1992). These behavior-based rating scales provide beneficial information to psychologists regarding the presence of difficulties experienced by children in multiple domains. However, a more in-depth analysis of a child's EF may also be needed.

Although the BASC-3 or the CBCL are appropriate to use when assessing a child with externalizing or internalizing behaviors for identification purposes, using a broadband behavior rating scale as the only data source for identifying and characterizing a child's presentation of EF strengths and weaknesses may be problematic. Specifically, broadband rating scales screen for the presence of executive dysfunction (Isquith, Roth, & Gioia, 2013; Lantrip, Isquith, Koven, Welsh, & Roth, 2016; Samuels, Tournaki, Blackman, & Zilinski, 2016; Skogan et al., 2015; Toplak, West, & Stanovich, 2013); however, narrowband EF rating scales provide more detailed data regarding a child's EF across multiple domains. Narrowband EF rating scale data are beneficial because EF domains are dimensional in nature; therefore, identification and characterization of EF

strengths and weaknesses may reveal different patterns of executive dysfunction common to various mental-health disorders (Gioia et al., 2016).

### **Current Research**

Clearly, it is important to identify relationships between EB and IB and EF. However, given the problems with traditional measures of EF, it seems important to use a measure that is easily administered in a single assessment yet provides detailed information on EF skills. The Behavior Rating Inventory of Executive Function--Second Edition (BRIEF2) is likely a good choice.

### **Behavior Rating Inventory of Executive Function—Second Edition**

The Behavior Rating Inventory of Executive Function--Second Edition (BRIEF2) is frequently used to measure EF in children, because it offers individualized data relative to functional and academic performance, which is not available from performance-based measures (Gioia, Isquith, Guy, & Kenworthy, 2015). The BRIEF2 is a valid and reliable measure designed to provide rich detail about a child's EF strengths and weaknesses. The BRIEF2 is often used in medical and psychological research, as well as in neuropsychological and school practice. It has been found effective for clearly identifying specific EF strengths and weaknesses in both children and adolescents with a variety of psychiatric disorders and problematic behaviors (Sinco, 2009). Given its effectiveness with identifying specific areas of executive dysfunction, it would be helpful to use this measure when evaluating children with emotional or behavioral difficulties.

### **Assessing EF in Children with Externalizing and Internalizing Behavioral Disorders Using the BRIEF2**

To date, no research has examined the relation between EF and behavior of children with externalizing and internalizing difficulties using the BRIEF2. One study has examined the relation between anxiety and the BRIEF2 (Gioia et al., 2016). Results

indicated that children with anxiety showed elevations in emotion, behavior, and cognitive regulation as compared to children without clinical diagnoses. Only one other study at present has published behavioral data derived from the BRIEF2. That study investigated the effectiveness of the BRIEF2 for identifying and characterizing presentations of EF in clinically referred children with and without ADHD (Jacobson et al., 2016). This study also showed elevations in emotion, behavior, and cognitive regulation for the participants with ADHD.

Currently no research has examined the level of behavioral difficulties across a clinical population using the BRIEF2. As stated above, isolated disorders have been examined, but not general levels of EB and IB in a mixed clinical sample. Thus, this research is novel since it uses a new EF measure, the BRIEF2. Further, since only specific diagnoses have been examined, the current study adds a level of understanding related to EB and IB in these clinical populations. More specifically, given the limited data on using the BRIEF2 to assess EF in children EB or IB, it is important that research examines the differences across these two types of presentations.

### **Purpose Statement**

The purpose of this study was to examine EF in children with EB and IB using the BRIEF2.

### **Hypotheses**

1. As externalizing behavior increases, it was predicted that reported problems associated with behavior regulation (BRI), emotion regulation (ERI) cognitive regulation (CRI) and total executive functioning (GEC) would also increase.

2. As internalizing behavior increases, it was predicted that reported problems associated behavior regulation (BRI), emotion regulation (ERI), cognitive regulation (CRI) and total executive functioning (GEC) would also increase.

## CHAPTER II: METHODOLOGY

This study aimed to understand the relation between externalizing and internalizing behaviors and executive functioning. Teacher ratings on the BASC-2 (teacher rating form) and the BRIEF2 (teacher rating form) and demographic data were collected from a large sample of children referred for clinical assessment. Data were analyzed and used to test the study's hypotheses. Data for this study were provided to the researcher by the authors of the BRIEF2. The data set was previously used to help evaluate the psychometric properties of the BRIEF2. At the time of data collection for standardization of the BRIEF2, the BASC-2 was the latest edition published. Therefore, the BASC-2 was used to identify EB and IB in the subjects.

### **Population and Sample**

Participating children were patients at neuropsychology clinics. Participants came from multiple regions across the United States, and samples were U.S. Census-matched to the national population parameters for age, gender, parent education level, race, ethnicity, and geographic region.

Subjects were recruited prior to 2014. To be eligible for the study, children needed to (a) be between the ages of 5 to 18, and (b) have no history of Special Education or psychotropic medication usage. Although they had no history of Special Education or medication usage, most of the children presented with psychological diagnoses. For this study, clinical diagnoses were only gathered on about 50% of the children. For the other 50% of the children, diagnoses were not recorded. Upon reviewing the data available, it appears that most of the children had a variant of ADHD (approximately 70%). The other 30% were either diagnosed with a learning disability or anxiety/depression. Even though the diagnoses were not recorded for the other 50% of the children, it is assumed that most

children had a clinical diagnosis or were suspected of having a disability or deficits, as they were patients at a neuropsychology clinic. For the current study, given that not all diagnoses were recorded, diagnostic criteria were not used as a variable when analyzing the data.

### **Data Collection Procedures**

For the current study, all procedures were conducted by the authors of the BRIEF2 who collected and stored the data. The authors provided the researcher with data collected during the recent standardization of the BRIEF2. Data were collected for 487 children and adolescents, who were patients at neuropsychological clinics. Participants were teachers of the children and adolescents who were referred by their parents, schools, therapists or physicians for neuropsychological evaluation in the authors' clinical practices. Additionally, participation was voluntary and not required.

Data were collected as part of routine clinical practice. Parents signed informed consent for the evaluation. The consent form also allowed for future research with the data. The current study was related to the teacher's evaluation of the child. To be eligible to provide the data, teachers were required to be involved with the child daily, which they endorsed prior to completing each measure.

Teachers were contacted by parents and asked to complete the BRIEF2 and the BASC-2, as part of routine clinical practice. Teachers who completed the two hard-copy questionnaires returned them directly to the clinicians via self-addressed stamped envelopes provided by the clinicians. The data consisted of BASC-2 and BRIEF2 measures completed by the children's teachers, in which ratings were provided based on observation of the children.

Questionnaires were scored, and scores were entered in secure databases in the authors' clinics along with demographics, historical information, and all other test data

per routine clinical practice. Paper records were stored in locked file cabinets in medical records storage. The test authors and their clinical and support staff had access to the medical records as part of routine clinical practice. For the purposes of this study, data were summarized in SPSS and provided to the current researcher by the authors in de-identified form.

The standardization study was exempt from IRB review as the data were retrospectively abstracted from clinical files and provided in summary form without any identifying information. Participants' privacy was protected; no results could be tracked back to a single participant. Additionally, participation was voluntary and not required. The procedures for analyzing and using this data set were approved by the UHCL Committee for the Protection of Human Subjects.

### **Instrumentation**

#### **Behavior Assessment System for Children—Second Edition (Teacher Rating Scales)**

The Behavior Assessment System for Children—Second Edition (Teacher Rating Scales: BASC-2 TRS; Reynolds & Kamphaus, 2004) is a 100-139-item broadband teacher-report instrument designed to measure a student's adaptive and problem behaviors in the school setting. The BASC-2 (teacher form) has three forms which target three age levels: preschool (ages 2-5 with 100 items), child (ages 6-11 with 139 items), and adolescent (ages 12-21 with 139 items). The BASC-2 (teacher form) consists of behavior descriptors that respondents rate on a four-point frequency scale (i.e., Never, Sometimes, Often, Almost Always). Raw scores of 0-3 are added to create summary scores, which are translated into T-scores for each scale and composite. A T-score of 50 represents the mean. Overall, a higher T-score represents more problems.

Scales of the BASC-2 TRS comprise five composites—Externalizing Problems, Internalizing Problems, School Problems, Adaptive Skills, and the Behavior Symptoms

Index. The internal consistency of the BASC-2 TRS across composite scores falls above .90 for all scales. The individual clinical and adaptive scales mostly fall above .80. The Externalizing Problems Composite has high reliability with Cronbach's alpha coefficients spanning from .95 to .97 across the normative population. The Internalizing Problems Composite also has high reliability with Cronbach's alpha coefficients ranging from .87 to .92 across the normative population (Reynolds & Kamphaus, 2004).

It is important to note the Behavior Symptoms Index, often used as an indicator of overall maladaptive behavior, was not used for analysis in this study. The purpose of this study was to examine EF in children with externalizing and internalizing behaviors. Studying overarching behavior would not have served this purpose.

Additionally, the School Problems Composite was not used for analysis because it is comprised of the Attention Problems and Learning Problems scales. These scales are representative of teacher-perceived learning and cognitive abilities of the student, and the School Problems Composite reflects a teacher's perception of the presence of behaviors that are likely to interfere with academic achievement. This study did not incorporate the School Problems Composite in any analyses as the study was designed to investigate solely the relation between EB and IB and EF, not the effects of cognition on learning.

### **Behavior Rating Inventory of Executive Function--Second Edition (Teacher Form)**

The Behavior Rating Inventory of Executive Function—Second Edition (Teacher Form; BRIEF2-TF; Gioia, Isquith, Guy, & Kenworthy, 2015) is a 63-item narrowband teacher-report instrument designed to measure EF in school-age children (5-18 years). Based on commonly agreed upon components of EF, the BRIEF2-TF consists of nine theoretically and empirically driven clinical scales that are combined into three indices. The three indices include Behavior Regulation Index (BRI), Emotion Regulation Index (ERI), the Cognitive Regulation Index (CRI). These indices are combined to form the



Global Executive Composite (GEC), which is the overall summary score. It is important to note the scales that compose the ERI do not include actual questions about emotions (e.g., mood and anxiety), but are specific to the regulation of those emotions. When creating the original BRIEF, the authors intentionally removed every item that was also present on the BASC to reduce overlap. As such, the BASC-2 measures feelings and behaviors, whereas the BRIEF2 measures the control of those feelings and behaviors.

Regarding the compositions of the three indices, the BRI is comprised of two clinical scales, including the Inhibit and Self-Monitor scales. The ERI is derived from the Shift and Emotional Control scales. Finally, the CRI is derived from the other five scales. These scales include Task Completion, Working Memory, Plan/Organize, Task-Monitor, and Organization of Materials. The internal consistency of the BRIEF2-TF is high with Cronbach's alpha coefficients spanning from .85 to .94 among the clinical scales and above .94 for the indices and GEC (Gioia et al., 2016). Raw scores of 1-3 are translated to summary scores, which are translated to T-scores for each scale and index. A T-score of 50 represents the mean.

### **Data Analysis**

An a priori power analysis using G\*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007) was run to identify the number of participants required for the most complex analysis model to be run. The power analysis indicated the need for 94 participants for 80% power for detecting a small sized effect (0.10) when employing the traditional .05 criterion of statistical significance.

Data were analyzed using correlational methods and a t-test. The relation between age and the indices of the BRIEF2 were analyzed using correlations. The relationship between gender and indices of the BRIEF2 were analyzed using t-tests.

## CHAPTER III:

### RESULTS

#### Descriptives

The data set was provided to the researcher after the authors of the BRIEF2 removed subjects with incomplete data. Therefore, data from each subject included both BASC-2 and BRIEF2 data. Teachers reported on 487 participants. Of the participants, 281 (57.7%) were male and 206 (42.3%) were female. Students' mean age was 11.04 years (range 5-18 years) with a standard deviation of 3.46 years. Overall, the mean T-scores on the indices of the BASC-2 and the BRIEF2 were within normal range (see Table 3.1).

Table 3.1

*Descriptives for BASC-2 composites and BRIEF2 indices used*

	<i>BRI</i>	<i>ERI</i>	<i>CRI</i>	<i>GEC</i>	<i>EPC</i>	<i>IPC</i>
<i>Mean</i>	56.27	56.13	60.94	59.54	48.83	52.16
<i>SD</i>	14.20	12.50	12.24	11.98	9.31	12.37
<i>Range</i>	39-90	41-90	38-90	38-90	40-89	38-113

*Notes:*

*BRI = Behavior Regulation Index; ERI = Emotion Regulation Index; CRI = Cognitive Regulation Index, GEC = Global Executive Composite; EPC = BASC-2 Externalizing Composite; IPC = BASC-2 Internalizing Composite*

#### Relation Between Demographics and Behaviors

Regarding demographics, both age and gender were related to EB and IB. More specifically, externalizing ( $r = -.24, p < .001$ ) and internalizing ( $r = -.14, n = 483, p < .05$ ) behaviors decreased as age increased. Additionally, males were rated as having more EB ( $M = 50.45$ ) than females ( $M = 46.62; t(485) = 4.58, p < .001$ ). Significant difference was also found between genders for ratings of IB. Females were endorsed as having higher IB ( $M = 53.22$ ) than males ( $M = 51.39; t(483) = -1.604, p = .034$ ).

## **Relation Between Externalizing Behaviors, Internalizing Behaviors, and Executive Functioning**

The behavior, emotion, and cognitive regulation subscales of EF as well as the overall GEC score, were associated with EB (.47 to .80; see Table 2), such that children who had more EB also had more problems with behavior regulation, emotion regulation, cognitive regulation, and overall EF. Additionally, children with more IB had significantly more problems with behavior regulation, emotion regulation, cognitive regulation, and overall GEC score (.27 to .58; see Table 3.2).

Table 3.2

### *Relation amongst measures*

	<i>EPC</i>	<i>EPC</i> <i>P-Value</i>	<i>IPC</i>	<i>IPC</i> <i>P-Value</i>
<i>BRI</i>	.80**	< .001	.27**	< .001
<i>ERI</i>	.58**	< .001	.58**	< .001
<i>CRI</i>	.47**	< .001	.47**	< .001
<i>GEC</i>	.68**	< .001	.40**	< .001

Notes:

*BRI* = Behavior Regulation Index; *ERI* = Emotion Regulation Index; *CRI* = Cognitive Regulation Index, *GEC* = Global Executive Composite; *EPC* = BASC-2 Externalizing Composite; *IPC* = BASC-2 Internalizing Composite; *GEND* = Gender

\* = Results are significant at the 0.05 level

\*\* = Results are significant at the 0.001 level

### **Regressions for Externalizing and Internalizing Behaviors**

Multiple regression analyses were used to predict EB and IB based on the EF variables and demographics (i.e., age and gender). The EF variables and demographics explained a significant amount of variance in EB ( $R^2 = .10, p < .001$ ). Holding age and gender constant, children's EB increased .35 units with every one unit increase in BRI ( $p < .001$ ). Relation between EB and ERI (-.04) was not significant ( $p = .676$ ). Additionally, relation between EB and CRI (-.28) was also not significant ( $p = .248$ ). Finally, relation

between EB and the GEC (.49) was not significant ( $p = .224$ ). Moreover, children's EB were found to decrease .42 units for every year increase in age ( $p < .001$ ).

When predicting IB, significance was found ( $R^2 = .026$ ,  $F(2, 477) = 6.31$ ,  $p = .002$ ) with the BRIEF2 ERI when holding age and gender constant. For example, participants' IB decreased .41 points with every increase in score on the BRI ( $p = .032$ ). More specifically, predicted IB increased .41 points with every one-point increase on the ERI ( $p = .032$ ). Though IB were shown to decrease .48 points for every increase in score on the CRI, this result was not significant ( $p = .277$ ). Additionally, the IB score increased .96 points for every increase in score on the GEC; however, this result was also not significant ( $p = .191$ ). Regression results indicated BRI and ERI accounted for 3% of the variance in IB. Moreover, for every decrease in a child's age, IB were shown to decrease .51 points ( $p = .002$ ).

### **Summary**

Results from this study suggest moderate to high correlations between children's EB and teachers' ratings on the BRI, ERI, CRI and GEC of the BRIEF2. Additional results suggest low to moderate correlations between children's IB and teachers' ratings on all indices of the BRIEF2. Independent t-test results suggest significant differences in teachers' ratings of males versus females on the BRI, CRI, and GEC of the BRIEF2. Additionally, males were found to have been rated higher than females on EB whereas females were found to have been rated higher than males on IB. In addition, both EB and IB ratings were found to decrease with age. Finally, multiple regressions for EB indicate that as BRI ratings increased, EB ratings also increased. However, no other index of the BRIEF2 was found to significantly lead to increase or decrease in EB ratings. Finally, IB were found to decrease with higher ratings on the BRI and increase with higher ratings on the ERI. The CRI and GEC did not lead to an increase or decrease in IB ratings.

## CHAPTER IV: DISCUSSION

This study examined the use of the BRIEF2 for investigating the relation between EB and IB and EF. The BRIEF2 is a more recent standardized assessment for EF. As EF is usually measured using performance-based measure, the BRIEF2 is a more direct measure of EF in children because it offers individualized data relative to functional and academic performance (Gioia et al., 2015). The purpose of this study was to use this measure to further understand the relation between EB and IB and EF. In particular, the intention was to identify whether behavior regulation, emotion regulation, and cognitive regulation may be related to EB and IB as endorsed on the BRIEF2.

A large body of literature exists analyzing the relation between these constructs using the BRIEF; however, literature on this relation using the BRIEF2 is greatly lacking. Because of this, the BRIEF2 (teacher form) was used to gain further insight about the presentation of the subjects' EB and IB. The BRIEF2 was used to provide data regarding the subjects' executive weaknesses (behavior regulation, emotion regulation, cognitive regulation) that may be related to EB or IB. By using the BRIEF2, the current study found that EB and IB were related to demographics of the subjects and EF.

### **Demographics and Externalizing and Internalizing Behaviors**

Regarding demographics and EF, the current study found that both age and gender were related to EB and IB. When examining EB, research has suggested a relation between age and EB (younger children having more EB), which this study's results supported. This finding is not surprising for multiple reasons. First, younger children developmentally have less control, less attention, and more behavioral difficulties. Second, this study examined a clinical population and these behaviors are difficult for younger children, even with a diagnosis (Schoemaker, Mulder, Deković, & Matthys,

2013). Given this, it is important to consider early EF intervention for younger children. As Schoemaker et al. (2013) reported in their meta-analysis on pre-school children and EF, intervention in behavior regulation, emotion regulation, and cognitive regulation domains of EF may serve to reduce difficulties in self-regulation in this population.

When examining age and IB, results were different from what has been largely reported in the literature. Research demonstrates that older children often have greater internalizing behaviors as compared to younger children (Gage, 2013; Maric, Bexkens, & Bögels, 2018); however, in this study, younger children had more IB than older children. Given the result differences, it is possible that the use of the BASC-2 led to this difference in findings. More specifically, the Depression scale (a scale that feeds into the IBC on the BASC-2) is comprised of several items that may be interpreted by the rater as representing externalizing behaviors rather than internalizing. For example, items on the Depression scale ask about the child's level of perceived irritability, tantruming, and verbal outbursts of negativity. Given the likelihood of an externalizing interpretation of the items in the Depression scale, these results are not surprising. Studies have suggested that teachers are more attuned, typically, to EB than IB in students (Achenbach, McConaughy, & Howell, 1987). Additionally, elementary teachers generally know their students well as they are often with the students for most of the day. Whereas, teachers at the secondary level often have one class period per day with their students. Therefore, teachers of younger children may be more likely to notice and report IB in their students which may have led to the increased endorsement of IB in younger children in this sample.

Gender was also related to both EB and IB. This result is consistent with the current research as multiple studies have found that male children have more externalizing problems (Giancola & Mezzich, 2000; Gioia et al., 2016; Peters, Algina,

Smith, & Daunic, 2012; Urazán-Torres et al., 2013) and female children have more internalizing problems (Biederman, Faraone, & Spencer, 1994; Gage, 2013; Maric et al., 2018; Rucklidge & Tannock, 2001). Per the literature, this is consistent with both “typical” children and those with clinical diagnoses. The results related to EB are not surprising given that the vast majority of students receiving Special Education for externalizing emotional disturbance are males (Bradley, Henderson, & Monfore, 2004; Coutinho & Oswald, 2005; Sinco, 2009) and females typically present with IB more often than males (Gage, 2013; Wagner, Müller, Helmreich, Huss, & Tadić, 2015).

### **Executive Functioning and Externalizing Behaviors**

Overall, all areas of EF (behavior regulation, emotion regulation, and cognitive regulation) and the overall EF score were related to EB. When examining the effects of behavior regulation on EB, it is understandable that difficulties with behavior regulation are related to EB. Current literature suggests these children struggle with inhibiting aggressive behaviors and monitoring the effect their behavior has on others (Gioia et al., 2016). In line with the literature, teachers in this study endorsed that children with difficulties in behavior regulation also have EB. Such results may be helpful to consider when creating and implementing targeted behavior regulation interventions to reduce a child’s EB.

When examining the effects of emotion regulation on EB, it also makes sense that results from this study support the current literature. Current literature indicates cognitive flexibility and emotional control (i.e., emotion regulation) may be deficient in children with EB (Bunford et al., 2015; Ghassabian et al., 2014; Gioia et al., 2016; Wagner et al., 2015). Children who struggle in this area may have difficulty shifting from one problem-solving approach to another, both socially and academically. They also may be verbally aggressive when overwhelmed with little awareness, or concern, for the impact of their

behavior on others. Difficulties with problem solving in class may lead to aggressive outbursts, which are easily recognized by classroom teachers (Sinco, 2009). These findings are important for intervention purposes. Learning and practicing multiple problem-solving methods, and teaching the child about the relation between thoughts, feelings, and subsequent behaviors (as conceptualized through Cognitive Behavior Therapy), could serve to reduce the presence of EB in these children.

When examining the effects of cognitive regulation on EB, the results of this study support the literature. Difficulties in cognitive regulation may be less challenging for teachers to identify and endorse as skills associated with cognitive regulation directly relate to academic performance. These students generally have lower academic performance than their peers (Michael Eysenck, Payne, & Derakshan, 2005; Owens, Stevenson, Hadwin, & Norgate, 2012). They appear less motivated to engage in tasks they perceived as difficult (Owens et al., 2012), they struggle with working memory, and struggle with behavior and thought organization (Gioia et al., 2016). Such findings serve to facilitate more targeted interventions. By developing and implementing interventions for cognitive regulation, children with EB may experience more academic success which may result in less frequent and less severe EB.

Outside of individual effects of EF areas, all three areas contributed to the variance seen in the level of EB. Thus, this study's findings contribute support for the body of literature suggesting that behavior, emotion, and cognitive regulation domains of EF are related (Goldberg, 2001; Mahone et al., 2002; Pribram, 1973; Tucker & Derryberry, 1992). While this is not a new finding, it is important to report supported findings as the prevailing theory for EF, and the theory used as the basis for this study, states these three domains of EF (BRI, ERI, and CRI) are interrelated yet distinct (Gioia et al., 2016) and oversee all cognition.



The results also support the theoretical ideation that children with difficulties in EB may also experience related difficulties in behavior, emotion, and cognitive regulation (Barkley, 2012; Gioia et al., 2016; McCloskey, Hewitt, Henzel, & Eusebio, 2009). For example, children with EB also experience difficulties in behavior regulation. They demonstrate difficulty with inhibition and monitoring the effects of their behavior on others. They also have difficulty with cognitive flexibility and controlling their emotions (emotion regulation). They also demonstrate dysfunction in reference to working memory, planning, problem-solving approaches, and organization of their behaviors and thoughts (cognitive regulation; Pennington & Ozonoff, 1996).

### **Executive Functioning and Internalizing Behaviors**

Overall, all areas of EF (behavior regulation, emotion regulation, and cognitive regulation) and the overall EF were related to IB. When examining the effects of behavior regulation on IB, it is not surprising that results of this study are in line with the literature. Teachers can observe a child's limited ability to maintain composure when presented with stressors, as this difficulty may lead to raging and tantruming. This is likely because the child with IB has been pushed beyond their limited ability to cope with stressors (Gage, 2013; White et al., 2011). These results are important for intervention purposes. By teaching children with IB methods for managing their behavior regulation (i.e., coping techniques), this may serve to reduce the impact of IB.

When examining the impact of emotion regulation on IB, these results support the current literature. Teachers can observe and endorse difficulties with transitioning and altering problem-solving techniques to fit the demands of different problems (Gioia et al., 2016). Further, identification of a child's inability to modulate their emotional responses may be done by observing the child's emotional lability and outbursts (Gioia et al., 2016). These findings may serve to help parents, educators, and mental health providers

focus intervention efforts on reinforcement when the child uses various problem-solving approaches taught to regulate their emotional responses. This, in turn, may serve to reduce the presence and impact of a child's IB.

Cognitive regulation is related to IB as noted in the literature (Peters et al., 2012; Wagner et al., 2015), and is also supported by findings from this study. As with cognitive regulation and EB, teachers can easily identify a child with IB, who is also having difficulty with cognitive regulation, because such difficulties are evident in the child's academic and social performance in the classroom. Children with IB and cognitive dysregulation struggle with diminished working memory (Pennington, Bennetto, McAleer, & Roberts, 1996), which impacts academic skills. For example, diminished working memory affects the child's ability to follow multi-step directions. Children with IB and cognitive dysregulation also have difficulty planning and organizing their approach to problems (Andreotti et al., 2013; Gioia et al., 2002). For example, this could be noticed by teachers in the child's disorganized attempt at written expression. These findings are beneficial to those seeking to intervene with these students, as interventions targeting cognitive regulation could reduce the impact and presence of a child's IB.

Outside of the individual effects of EF areas (BRI, ERI, CRI), all three areas contributed to the variance seen in the level of IB. Greater levels of BRI, ERI, and CRI difficulties, directly related to greater difficulties with IB. Additionally, these results support the theory that children with difficulties in IB may experience related difficulties in behavior, emotion, and cognitive regulation though the presentation is different than in children with EB (Gioia, Isquith, Guy, & Kenworthy, 2016). For example, children with IB and behavior dysregulation may rage or have tantrums when pushed beyond their limits of emotional comfort. Additionally, children with IB and emotion regulation difficulties have trouble adjusting problem-solving techniques in social situations and

moderating their emotional responses as they experience emotional extremes and have fewer coping abilities. Finally, they experience difficulties with working memory, planning, and organization due to focusing on areas of emotional perseveration or ruminating on troubles.

### **Summary**

Although previous studies demonstrated the relation between EF and EB and IB, no study to date has demonstrated such relation using the BRIEF2. As such, findings from this study are important for multiple reasons. First, these findings lend support for the use of the BRIEF2 to identify EF deficits in children. Second, these findings may be important for using the BRIEF2 to identify areas of EF deficit within children with EB and IB for implementation of targeted interventions. More specifically, addressing EF difficulties in children with EB or IB may assist in the child's experiencing of EB or IB which, in turn, may benefit academic performance. Based on this information, students with EB or IB may be expected to have difficulties in the classroom environment with common executive skills such as task initiation, recollection of instructions, rules, or processes for problem solving, and assignment planning. They also may demonstrate difficulty with recognizing the "big picture" without becoming entangled in the details, accurately estimating the time needed to complete a task, and engaging in cognitive flexibility as needed. Even the most ordinary task such as writing a brief paragraph about their weekend could prove problematic for students with EB or IB. In this example, students with EB or IB may exhibit difficulty beginning the first sentence, organizing their thoughts on the topic, and recalling the specific instructions of the assignment. With these difficulties in mind, a simple task becomes more complex for these children. Thus, this unanticipated level of difficulty and complexity leads to more stress for these students than with a "typical" student. As such, this common task becomes extremely

stressful, which then becomes an obstacle for these children (Algozzine & Ysseldyke, 2014). Such an increase in frustration may lead to further EB or IB.

### **Recommendations**

Considering the significant relation between EF and EB and IB, evaluators may wish to include an EF narrowband rating scale, such as the BRIEF2. Although the BRIEF2 is not designed to be the sole measure used to identify children with EB and IB, it may prove helpful in gaining new awareness of EF difficulties experienced by children with EB and IB. Such data may inform the creation and selection of targeted interventions from a neuropsychological approach. Interventions targeting neuropsychological deficits such as EF can be rare for children with EB and IB (Algozzine & Ysseldyke, 2014; Mattison, Hooper, & Glassberg, 2002). Results from the current study expose the significant relation between EF and EB and IB. As such, it is recommended that EF difficulties are considered when identifying intervention approaches for children with EB and IB. Interventions encompassing all areas of deficit, including executive dysfunction, may prove helpful for increasing the likelihood of success for children with EB and IB.

### **Limitations**

As with most research, this study had several limitations, which may decrease generalizability of the results. A limitation of this study involves the selected measures. This study focused on teacher ratings of students' behavior and EF in the classroom using the BASC-2 and BRIEF2. Given that it is considered best practice to use multiple measures and methods when identifying functional strengths and weaknesses (Decker, Hale, & Flanagan, 2013), using one measure for EF in this study may have reduced the generalizability of the results. Additionally, this study used the BASC-2 as it was the

most recent version of the BASC at the time of data collection. As the BASC is now in the third edition, newer norms for this measure may lead to different results.

Additionally, socioeconomic status and ethnicity were not considered as factors for the data analyses due to the database limitations. Future studies may wish to include socioeconomic status and ethnicity along with gender and age as this would be in line with literature in this area (Coutinho & Oswald, 2005; Cullinan & Sabornie, 2004; Gresham, 2005). Overall, singular measures and limited demographic variables were major limitations of the current study. It will be important for future studies to consider these variables when investigating further the relation between EF and EB and IB.

Additionally, no functional outcomes such as grades or standardized test scores were provided in the sample. However, the focus of this study did not target qualitative or performance-based data to determine EB or IB. The purpose of this study was to determine the appropriateness of the BRIEF2 for identifying areas of EF deficit in children with EB and IB. Future studies may wish to incorporate such elements as real-world outcomes for this population are important to consider when determining the effectiveness of interventions.

### **Future Research**

This study served to support using the BRIEF2 for identifying EF deficits in children with EB and IB. It will be important for future research using the BRIEF2 to identify the reason for the link between and EB and IB, as well as the directional relation. As such, further investigation of this complex relation using the BRIEF2 is necessary. This lack of understanding is compounded by the fact that children who struggle with EB and IB struggle with a wide variety of symptoms. Thus, finding commonalities in these groups may prove difficult.

Subsequently, the researcher was unable to control for certain key demographic variables. An examination of EF in relation to EB and IB while controlling for variables such as socioeconomic status and ethnicity may be helpful when addressing the full impact of EF on EB and IB. Such analysis would serve to further the literature.

Finally, further investigation into the comparison of parent and teacher ratings on the BRIEF2 and EB and IB would be beneficial as well. Studies have highlighted the frequent difference between parent and teacher ratings (Achenbach et al., 1987; Gioia et al., 2016). However, despite the difference in rating severity, there are often common patterns across both raters. Such patterns would be helpful to investigate in reference to EF deficits of students with EB and IB.

### **Conclusions**

The current study highlighted the need to evaluate EF in children with EB and IB. Increases in domains of EF were found to have significant effects on behavior. Given that EB and IB are related to EF, the current study provides further evidence that this relation is important. However, being that this is one of the first studies to use the BRIEF2, this study lends support for considering the BRIEF2 when assessing EF.

Having a new standardized measure allows professionals to consider new norms when identifying what is considered atypical EF. New standardization also incorporates the most current theoretically based findings in determining and identifying collinearity within the measure. As such, the BRIEF2 may be considered when identifying areas of EF deficit experienced by children with EB and IB.

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APPENDIX A:  
UHCL IRB APPROVAL LETTER

See Protection of Human Subjects, CPHS Application Form, & Consent and Assent Forms.  
Also, see Federal & University Guidelines for more details.

*Save MS Word Version on your computer or disk to complete application form.*



**COMMITTEE FOR THE PROTECTION OF HUMAN  
SUBJECTS**

**Faculty/Sponsor Application for Investigation Involving Human Subjects**  
2700 Bay Area Blvd. 281.283.3015 FAX 281.283.2143  
Houston, TX 77058-1098 [uhcl.edu/research](http://uhcl.edu/research)

DATE: January 16, 2019-May 2, 2019

TITLE: Executive Functioning Differences in Students with Emotional Disturbance

PRINCIPAL INVESTIGATOR(S): Kristin R. Streich, SSP

STUDENT RESEARCHER(S): \_\_\_\_\_

FACULTY SPONSOR: Mary B. Short, Ph.D.

PROPOSED PROJECT END DATE: July 2020

How will this project be funded: Principal Investigator will fund this project

If grant, this project is:  Pending  Funded – Federal  Funded – Other

Grant title and/or contract number (if available): \_\_\_\_\_

All applicants are to review and understand the responsibilities for abiding by provisions stated in the UHCL's Federal-wide Assurance (FWA 00004068), approved by the Office of Human Research Protections (OHRP) on March 9, 2004: (a) The Belmont Report provides ethical principles to follow in human subject research; and (b) Federal regulations 45 CFR 46 and all of its subparts A, B, C, and D are the minimum standards applied to all of UHCL's human subject research.

See <http://www.uhcl.edu/research> -- Protection of Human Subjects, Federal-wide Assurance.

For questions, contact the Office of Sponsored Programs (OSP) at 281-283-3015 or [sponsoredprograms@uhcl.edu](mailto:sponsoredprograms@uhcl.edu)

**Principal Investigator (PI) / Faculty Sponsor (FS) Responsibilities Regarding Research on Human Subjects:**

- PI / FS acknowledges reviewing UHCL's FWA (Federal-wide Assurance) approved by the Office of Human Research Protections (OHRP). PI / FS understands the responsibilities for abiding by provisions of the Assurance.
- The PI / FS cannot initiate any contact with human subjects until final approval is given by CPHS.
- Additions, changes or issues relating to the use of human subjects after the project has begun must be submitted for CPHS review as an amendment and approved PRIOR to implementing the change.
- If the study continues for a period longer than one year, a continuing review must be submitted PRIOR to the anniversary date of the studies approval date.
- PI / FS asserts that information contained in this application for human subjects' assessment is complete, true and accurate.
- PI / FS agrees to provide adequate supervision to ensure that the rights and welfare of human subjects are properly maintained.
- Faculty Sponsors are responsible for student research conducted under their supervision. Faculty Sponsors are to retain research data and informed consent forms for three years after project ends.
- PI / FS acknowledges the responsibility to secure the informed consent of the subjects by explaining the procedures, in so far as possible, and by describing the risks and potential benefits of the project.
- PI / FS assures CPHS that all procedures performed in this project will be conducted in accordance with all federal regulations and university policies which govern research with human subjects.

**A. DATA COLLECTION DATES:**

1. From: September 2018
2. To: June 2020
3. Project End Date: July 2020

**B. HUMAN SUBJECTS DESCRIPTION:**

1. Age range: Ages 5-19-Ages 3-22
2. Approx. number: 94-300
3. % Male: 50%
4. % Female: 50%

**C. PROJECT SUMMARY:**

**Complete application using commonly understood terminology.**

**1. Background and Significance**

Provide a **CONCISE** rationale for this project, based on current literature, information, or data. Include references as appropriate.

Many children receive Special Educational supports and services. Of those children, many receive these services due to meeting eligibility requirements for the IDEA category of Emotional Disturbance (ED). ED is a broad category encompassing multiple severe emotional and/or behavioral difficulties a student may have to be eligible for Special Education (U.S. Department of Education, 2004). However, the five criteria of ED eligibility often can be broken down into two categories of difficulties, including externalizing and internalizing (Achenbach, 1982; Gage, 2013; Kauffman & Landrum, 2012).

Beyond needing Special Education services, these children can have both short-term and long-term difficulties. One of those difficulties could be with executive functions (EF); however, given the other difficulties for both externalizing and internalizing ED, difficulties with EF may appear different depending on type of ED (externalizing versus internalizing). No research has been published to date on executive dysfunction experienced by students with externalizing versus internalizing ED, but research has indicated the presence of difficulties with EF for students with ED (Johnson, Kemp, Heard, Lennings, & Hickie, 2015; Miyake, Emerson, & Friedman, 2000; Visu-Petra, Miclea, & Visu-Petra, 2013; Wiebe et al., 2011). Therefore, it is important to explore the relation between EF and ED, particularly with a reliable and valid behavior observation rating scale such as the BRIEF2.

Given the number of students with ED and the severe difficulties associated with ED, it is important to understand if executive dysfunction could be a contributor to these difficulties. If it is a contributor, then assessment of executive dysfunction is important for decreasing the impact of emotional and behavioral dysregulation. Thus, the purpose of the current study is assessment and comparison of EF in students with ED using the BRIEF2.

**2. Specific Aims**

Purpose, Hypotheses/Research Questions, Goals of the Project. BRIEFLY describe the purpose and goals of the project (include hypotheses or research questions to be addressed and the specific objectives or aims of the project. Describe or define terms or methods as needed for CPHS reviewer's understanding.

The purpose of this study is to assess and compare executive functions in students with Emotional Disturbance using the BRIEF2-TF.



**Research Questions:**

1. Do students with behavior patterns consistent with externalizing Emotional Disturbance have significantly greater dysregulation in behavioral regulation domains of executive functions than students with internalizing Emotional Disturbance?
2. Do students with behavior patterns consistent with internalizing Emotional Disturbance have significantly greater dysregulation in emotional regulation domains of executive functions than students with externalizing Emotional Disturbance?
3. Do students with behavior patterns consistent with combined Emotional Disturbance have significantly greater dysregulation in cognitive regulation domains of executive functions than students with externalizing or internalizing Emotional Disturbance?

**Hypotheses:**

1. Students with behavior patterns consistent with externalizing Emotional Disturbance will be rated as having significantly greater dysregulation in behavioral regulation domains of executive functions than students with internalizing Emotional Disturbance.
2. Students with behavior patterns consistent with internalizing Emotional Disturbance will be rated as having significantly greater dysregulation in emotional regulation domains of executive functions than students with externalizing ED Emotional Disturbance.
3. Students with behavior patterns consistent with combined Emotional Disturbance will be rated as having significantly greater dysregulation in cognitive regulation domains of executive functions than students with externalizing or internalizing Emotional Disturbance.

The goal of this project is to better understand specific types of executive dysfunction experienced by students with behavior patterns consistent with externalizing, internalizing, and combined Emotional Disturbance to aid in intervention.

**3. Research Method, Design and Procedures**

- (A) Provide an overview of research methodology and design; e.g., how the data are to be collected, analyzed, and interpreted.
- (B) Provide step-by-step description of procedures and how they are to be applied. Procedures are to begin from CPHS approval and end when data compiled and results reported. Possible information to include: What are participants asked to do? When and where are they to participate? How long will it take to participate? Describe type of research information gathered from participants, i.e., data being collected.

Note that ethical responsibility of researcher to participant does not end until participant's information has been destroyed. Research documentation cannot be destroyed for up to three years after completion of a study.

**Participants**

Participants (approximately 94) will consist of archival assessment data of students (elementary to high school) from Texas school districts who have been, or are currently being, evaluated by their school district for Emotional Disturbance. Participants (approximately 300) will consist of archival data collected via a database used by the authors of the BRIEF2 for norming purposes.

**Procedure**

District LSSPs will be asked to input index and scale scores from the Behavior Rating Inventory of Executive Function, Second Edition—Teacher Form (BRIEF2 TF) and minimal demographic data (student's grade, ethnicity, and gender) administered as part of students' Emotional Disturbance FIEs into an encrypted web-based data collection form via Qualtrics.com (HIPAA and FERPA compliant).

LSSPs will be asked to input de-identified scores/data into the web-based data collection form by one of two methods:

- (a) LSSPs will administer a BRIEF2 TF to one teacher per student undergoing an already-planned Emotional Disturbance FIE and input the de-identified scores/data into the data collection form
- (b) LSSPs will input de-identified scores/data from BRIEF2 TFs that have already been administered as part of students' previous Emotional Disturbance FIEs

Data collection forms (see "Qualtrics Data Collection Form" file for specific listing of data to be collected) will be accessed by the district's LSSPs via Qualtrics.com and completed for each participant. District LSSPs will be provided with training as needed for inputting data into the encrypted web-based data collection form. Inputting of data will take the LSSPs approximately 5 minutes per participant. Data collected will be exported to the Statistical Package for the Social Sciences (SPSS) version 23.0 for analysis.

The authors of the BRIEF2 will provide the principal investigator with access to their de-identified database via an encrypted email. Upon receipt of the email, the principal investigator will identify and categorize participants with behavior patterns consistent with externalizing, internalizing, and combined ED based upon BASC-3 scale data. She will then identify the index and scale scores from the Behavior Rating Inventory of Executive Function, Second Edition for these categorized participants and demographic data (student's age, ethnicity, and gender) provided in the database and transfer this categorized data into the Statistical Package for the Social Sciences (SPSS) version 23.0 for analysis.

#### **Analysis**

Once the data is collected, it will be analyzed using the Statistical Package for the Social Sciences (SPSS) version 23.0. Descriptive statistics will be calculated for all variables. Analysis will then be conducted using multiple regression, with demographics (student's grade, age, ethnicity, and gender) as covariates, to study the effects of ED eligibility (externalizing, internalizing, and combined) on emotion, behavior, and cognitive regulation domains of EF with student's grade, age, ethnicity, and gender held constant. Effect size will also be calculated for all significant analyses to determine the degree of impact on EF presentation of each group of students with ED. Descriptive statistics and results of the regression analysis will be presented and discussed in the dissertation report.

#### **4. Instruments for Research with Human Subject**

Indicate instruments to be used.

- (A) Submit copies electronically, if possible.
- (B) Submit copy of copyrighted questionnaire for CPHS review. Copy kept on file by CPHS.
- (C) Examples of instruments are as follows: (1) Educational Tests, (2) Questionnaires/Surveys, (3) Psychological Tests, (4) Educational Materials, i.e., curriculum, books, etc., (5) Interview or Phone Script, or (6) human subjects recruitment advertisements.

##### ***Behavior Assessment System for Children—Third Edition (Teacher Rating Scales)***

The Behavior Assessment System for Children—Third Edition is a 164-item broadband teacher- and parent-report instrument designed to measure a student's adaptive and problem behaviors in the school setting. The BASC-3 has three forms which target three age levels: preschool (ages 2-5), child (ages 6-11), and adolescent (ages 12-21). The BASC-3 consists of behavior descriptors that the respondent rates on a four-point frequency scale (i.e., Never, Sometimes, Often, Almost always).

Scales of the BASC-3 comprises five composites—Externalizing Problems, Internalizing Problems, School Problems, Adaptive Skills, and the Behavior Symptoms Index. Also part of this instrument are

the probability indices, one of which is the EBD Probability Index which allows for identifying the similarity between the obtained behavioral ratings and the ratings of students identified as meeting eligibility for ED. The internal consistency of the BASC-3 across composite scores ranges from the middle to upper .90s, and across individual clinical and adaptive scales with a large majority of values above .80. The EBD Probability Index was classified as having high reliability with Cronbach's alpha coefficients spanning from .90 to .95 across the normative population (Reynolds & Kamphaus, 2015).

***Behavior Rating Inventory of Executive Function—Second Edition (Teacher Form)***

The Behavior Rating Inventory of Executive Function—Second Edition is a 63-item narrowband teacher- and parent- report instrument designed to measure EF in school-age children (5-18 years). The BRIEF2 consists of nine theoretically and empirically driven clinical scales that assess commonly agreed upon aspects of executive functioning.

Scales of the BRIEF2 comprise three indices—the Behavior Regulation Index (BRI), the Emotion Regulation Index (ERI), and the Cognitive Regulation Index (CRI)—and a summary score, the Global Executive Composite (GEC). Also part of this instrument are the Negativity, Infrequency, and Inconsistency validity scales. The internal consistency of the BRIEF2 was classified as high with Cronbach's alpha coefficients spanning from .85 to .94 among the clinical scales and all above .94 for the indices and GEC (Gioia et al., 2016).

**5. Human Subject Source and Selection Criteria**

Describe the procedures for the recruitment of the participants. Indicate when human subject involvement is expected to begin and end in this project. Example information to include:

- (A) Characteristics of subject population, such as anticipated number, age, sex, ethnic background, and state of health.
- (B) Where and how participants are drawn for subject selection criteria. Coercion or undue influence needs to be considered and eliminated.
- (C) How ensuring equitable subject selection.
- (D) If applicable, criteria for inclusion and/or exclusion and provide rationale.
- (E) Children are classified as a vulnerable population. See Subpart D, §48.401, of federal guidelines for additional safeguards aimed to protect the rights and welfare of these subjects.

~~Participants (approximately 94) will consist of archival assessment data of kindergarten through twelfth grade students from multiple Texas school districts who have been, or are currently being, evaluated by their school district for Emotional Disturbance. It is anticipated that participants will be of diverse age, ethnic, and socio-economic backgrounds and is expected to resemble that of national distributions. The researcher will contact multiple school districts in Texas to recruit participants. Districts who agree to participate in the study will receive a report delineating the findings of the study. Participants (approximately 300) will consist of an archival database of pre-kindergarten through twelfth grade students from multiple states who have been administered the BASC-3 and the BRIEF2-TF as part of the norming process for the BRIEF2. Participants are of diverse age, ethnic, and socio-economic backgrounds and resemble that of national distributions.~~

## 6. Informed Consent

For more details, see "Federal & University Guidelines" document, "Informed Consent" section.

- (A) Describe procedure for obtaining informed consent.
- (B) Use language that is appropriate for age or understandability of subjects.
- (C) Attach informed consent page.
- (D) If applicable, attach the following documents for review: (1) Parental permission form for participation of minors (under 18 years of age). (2) Assent form for children between ages 7 and 17: (2a) ages 12-17 must sign assent form; (2b) ages 7-11 must have witness sign attesting to child's positive assent.
- (E) Request CPHS waiver for documentation of informed consent, if appropriate. Justification is required. See "Federal & University Guidelines."

- A. Due to using archival data, the study is waiving consent. Districts will also be informed that participation is voluntary and not required.
- B. Not applicable
- C. Not applicable
- D. Not applicable
- E. Not applicable

## 7. Confidentiality

Describe how data will be safeguarded: (a) how confidentiality maintained; use of personal identifiers or coded data; (b) how data collected and recorded; (c) how data stored during project; (d) who has access to data or participant's identifiers; (e) who is to receive data, if applicable; (f) what happens to data after research is completed.

Note that research documentation, including signed informed consent forms, are safeguarded for three years after completion of study for federal audit purposes. Faculty sponsors are responsible for safeguarding research documentation completed by students.

- ~~A. Every effort will be made to maintain the confidentiality of participant data in this project. Only the principal investigators and research assistants will have access to the data. Separate from the data, researchers will maintain a single password protected excel sheet on an encrypted flash drive. The flash drive will be kept in a locked cabinet in the locked office of the faculty sponsor. All potentially identifying information will remain separate once data collection has been conducted. The information will only be kept temporarily and will be destroyed one month after completion of the study. Every effort will be made to maintain the confidentiality of participant data in this project. Only the principal investigator will have access to the data. Separate from the data, the principal investigator will maintain a single password protected excel sheet on an encrypted flash drive. The flash drive will be kept in a locked cabinet in the locked office of the faculty sponsor. All potentially identifying information will be removed by the authors of the BRIEF2 before allowing the principal investigator access. The information will only be kept temporarily and will be destroyed one month after completion of the study.~~
- ~~B/C. Data will be collected via a secure website, [www.qualtrics.com](http://www.qualtrics.com). The principal investigator will remove data stores periodically onto a password protected database and backup data on a flash drive. The principal investigator will assign a password to protect the database and backup data on a flash drive.~~
- D/E/F. The principal investigator and faculty sponsor will have access to all study related data; study data will not include personal identifiers. Data will be kept on file by the faculty sponsor and student investigator for a period no shorter than three years, after which the data will be destroyed.

## 8. Research Benefits

Describe any anticipated benefits to subjects as well as reasonably expected general results.

Benefits may include the opportunity to contribute to a better understanding of the neuropsychological deficits that may affect the educational performance of students with Emotional Disturbance. Benefits may also include a better understanding of executive dysfunction which may facilitate more targeted and effective interventions for students with Emotional Disturbance.

## 9. Risks

Describe any foreseeable risks to the subjects, whether physical injury, psychological injury, loss of confidentiality, social harm, etc., involved in the conduct of the research. Explain precautions taken to minimize these risks. If there are any foreseeable risks, provide contact information of organization(s) for professional treatment.

~~There are no foreseeable risks to the participants of this study. However, because the information will be collected via an internet data collection form, there could be potential risks to personal information. During actual internet procedures or accessing via an unprotected wireless system, there is possible risk of breach of confidentiality or data security. This risk to participants will be minimized by recording of data through an identification code on Qualtrics.~~  
There are no foreseeable risks to the participants of this study. During actual internet procedures or accessing via an unprotected wireless system, there is possible risk of breach of data security. This risk to participants will be minimized by encrypting the email containing the database information.

## 10. Other Sites or Agencies Involved in Research Project

Indicate specific site if not UHCL, e.g., school districts or school, clinics.

- (A) Obtain written approval from institution. Approval should be signed and on institution's letterhead. Other proof of documentation may be reviewed for acceptance by CPHS.
- (B) Institution should include the following information: (B1) institution's knowledge of study being conducted on its site; (B2) statement about what research study involves; (B3) outline specific procedures to be conducted at site; and (B4) identify type of instrument(s) used to collect data and duration needed to complete instruments; (B5) statement that identities of institution and participants will be kept confidential; (B6) institution's permission granting the use of its facilities or resources; and (B7) include copy of Informed Consent document(s) to be used in recruiting volunteers from the institution.
- (C) If at all possible, electronic copies of letter or other documentation are to be submitted with CPHS application.
- (D) If letters are not available at time of CPHS review, approval will be contingent upon their receipt.

~~Letters of approval have not been obtained to date. We ask that we receive pending approval from UHCL CPHS. Once we receive pending approval, we will give the approval letter to each school district. When the school districts provide us with a letter of agreement, the principal investigator will submit letters of approval to UHCL CPHS. We ask that we receive approval from UHCL CPHS as the co-author of the BRIEF2 provided us with a letter of agreement, and the principal investigator has submitted the letters of agreement to UHCL CPHS.~~



APPENDIX B:  
LETTER OF APPROVAL



April 23, 2019

Kristin Streich, LSSP, NASP  
Health Service Psychology  
University of Houston, Clear Lake  
2700 Bay Area Blvd.  
Houston, TX 77058

Dear Kristin:

On behalf of the authors of the Behavior Rating Inventory of Executive Function (BRIEF), I am pleased to offer our support for your research project examining patterns of scores on the BRIEF2 in students with internalizing and externalizing concerns.

As practicing psychologists trained in a scientist-practitioner model, we believe that research informs clinical work and clinical work informs research, and that it is our obligation to supervise, mentor, and support future generations who will continue to advance the field. We have always shared data and materials with students for theses or dissertations, and maintain a small fund to help defray the costs of BRIEF materials for students with limited resources both at home and abroad. We have no expectations of authorship or review for our support, though appreciate an acknowledgement. We always appreciate seeing the finished work so that we can know the outcome of your study. We would ask that you keep the data set for your own purposes and do not share the data without consulting with us.

In keeping with our clinical, research, and teaching mission, we are glad to support your work. I have sent to you electronically a de-identified clinical data set that includes over 400 separate cases of children and adolescents for whom parents and teachers completed both a BRIEF2 and the BASC2. Many cases also have a BASC2 Self Report of Personality completed by adolescents. This is likely the largest sample of matched BRIEF/BASC data available, and we have not analyzed this matched data set. We have examined the factor structure of the BRIEF2 and BASC2 separately by parent ratings and by teacher ratings and by self-reports. We have also examined correlations between the BRIEF2 and BASC2 for each of the raters separately. These are published in the validity discussion in the BRIEF2 Professional Manual. We have not examined parent-teacher-self-report dyads or triads, and we have not examined BRIEF2 profiles

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in students who are described as high on the internalizing or externalizing dimensions on the BASC2 as you propose to do.

There are many approaches to exploring the data set. I am quite familiar with the ins and outs of the data, and would be glad to consult with you about any questions regarding variables, their meaning, or approaches to data analysis.

I wish you the best with your project.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter K. Isquith". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Peter K. Isquith, Ph.D., ABPdN  
Licensed Psychologist  
Instructor in Psychiatry, Harvard Medical School  
Assistant Professor in Psychiatry, Geisel School of Medicine at Dartmouth