6-8-2010

Executive Functioning Skills in a School District: An Examination of Teachers' Perception of Executive Functioning Skills Related to Age, Sex, and Educational Classification

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EXECUTIVE FUNCTIONING SKILLS IN A SCHOOL DISTRICT: AN EXAMINATION OF TEACHERS' PERCEPTION OF EXECUTIVE FUNCTIONING SKILLS RELATED TO AGE, SEX, AND EDUCATIONAL CLASSIFICATION

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Education

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May 2010

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This correlational design study determined the level of teacher perception of student executive function as measured by the Behavior Rating Scale of Executive Function (BRIEF) within a district by examining chronological age, sex, and educational classification variables. The first research question compared the school district's general education population to the normative sample. Results indicated that the majority of scale and index scores were not significantly different from the normative sample.

The second research question compared general, gifted and special education students. Results confirmed previous research results, which indicate that special education students have significantly higher numbers and levels of clinically significant symptoms of executive dysfunction than general and gifted education students.

There was not a significant difference between males and females in terms of teacher perception of executive function. However, males consistently demonstrated higher percentages of clinically significant scores than females, and in the 14-18 age group, males' percentages trended upward while females' percentages trended downward from previously similar levels. Further study of general and special education males is recommended. Curriculum interventions for males may be indicated.

A Confirmatory Factor Analysis (CFA) indicated that the hypothesized 2-factor model with 3 items and 5 items on the BRI and MI, respectively, did not fit the data well. There was evidence that the scale Monitor may cross-load across both factors, and was excluded. One item from each Index; Inhibit and Organization of Materials, was also removed due to a lack of good fit. The remaining items provided evidence of good fit with observed data, with approximately 70% of the variance not shared. The use of the Global Executive Composite and the individual scales may be more appropriate than the Index scales.

In summary, in at least one school district, definite deficits were found in executive functioning that could be identified across grades and genders that suggest specific school wide and class wide interventions. Special education students continue to struggle with executive function issues. Many if not most interventions should be directed at executive functions instead of exclusive content based tutoring.

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CHAPTER I

INTRODUCTION

This research is centered on the use of the Behavior Rating Inventory of Executive Function (BRIEF). The teachers of a small rural school district in western Pennsylvania completed the BRIEF on 1119 students in a district of 1334. These results were used in three ways. First, the BRIEF school district sample was compared to the normative sample to gain insight into the comparability of the BRIEF to the school district sample. If the school district sample and the normative sample were similar, then results might be generalized to a wider set of populations, and potentially identify specific programming needs. Secondly, the school district sample was compared along sex, age and educational classification parameters. This is the major focus of the dissertation problem hypotheses and literature review. The purpose of these comparisons was to determine if descriptions could be made about the groups and their executive functioning, therefore making predictions about the needs of these groups. Lastly, a confirmatory factor analysis was conducted to determine if the individual scales were predictors of their respective factors. This would help determine if individual scales, factor indexes and/or the Global Executive Composite were appropriate measures to use when making statements about the needs of individuals based on BRIEF results.

The extent of executive dysfunction in a whole school setting is unknown at this time, because research has concentrated on small groups of individuals with diagnosed disorders. No studies of executive function have been done on a large scale using general education students, with the exception of the normative sample of the Behavior Rating Inventory of Executive Functioning Skills (BRIEF).

In this study, executive functioning is defined as a collection of cognitive processes that are responsible for guiding, directing, and managing behavior toward the pursuit of a goal-directed task as measured by the teacher's perception on the BRIEF (Gioia, Isquith, Guy & Kenworthy, 2000). Executive functioning skills are of critical importance for establishing and maintaining organizational skills, behavioral control, and metacognitive skills that are needed to function within the school environment, both behaviorally and academically (Dawson & Guare, 2004; Rose & Rose, 2007). A better understanding of the incidence of executive functioning difficulties within a typical population would enable districts to develop curricula and in-service programming to address typically occurring executive functioning needs. It might also provide insight into reasonable expectations for students and suggestions for school building organization (Gaskins & Pressley, 2007). For instance, some schools operate on a K-6 elementary; others operate on a K-3 or K-4 elementary. When executive functioning difficulties occur in 5th grade students in a middle school, is it truly related to executive functioning, or is it related to the expectations of a middle school 5th grade versus a 5th grade student who has elementary level expectations? It has been proposed by researchers that the identification of needs and appropriately implemented interventions for executive function would ultimately result in better academic achievement, fewer behavioral and organizational problems and fewer special education referrals (Meltzer, Pollica & Barzillai, 2007).

The Problem

Today's children are expected to display competency through meeting proficiency levels in reading, writing and mathematics through state administered tests in observance of the “No Child Left Behind” act, Scholastic Aptitude Test (SAT), and state and district assessments. Heavy homework demands are often required. In addition to these testing and academic burdens, students also have social and peer stressors, and juggle extracurricular activities and family responsibilities, often while lacking required sleep for optimal functioning. Current world and economic events including financial concerns related to the housing market, increased prices and job losses may contribute more stress to many students and their families. These stressors have created a need for time management, organizational, stress, and emotional coping skills which many adolescents lack (Bernstein & Waber, 2007). Brain imaging studies using functional Magnetic Resonance Imaging (fMRI) and other research has indicated that these skills might not be developmentally reasonable expectations for many adolescents (Brocki & Bohlin, 2004), but are increasingly expected.

Educators spend a great deal of time emphasizing learning and preparing for standardized state tests, but how much time is spent addressing executive functions, which appear to impact learning in such a significant manner (Dietzel & Edelstein, 2004)? Increasingly, schools are focusing on core subjects of English, Writing, Math and Science, those areas tested by the PSSA, and reducing or eliminating other non-tested areas such as art and music. When traditional subjects such as these are cut, the likelihood of adding executive function as an area to be addressed is not likely to be considered at all. In this study I propose to examine the occurrence of executive function within the whole school organization. This may promote the understanding of executive functioning on a group level, and potential consideration of executive function as a factor in curriculum development and educational organization. This is an opportunity to study the school district as an entity, made up of groups which can be compared with each other within the same environment.

Research Questions

Research question 1: Is there a difference between the Behavior Rating Inventory of Executive Function (BRIEF) Norm Sample and the School District with respect to the mean Scale, Index and Global Executive Composite (GEC) T-scores by sex (M/F) and age group (5-6, 7-8, 9-13, 14-18)?

Research question 2: Are there differences within the School District with respect to the incidence of clinically significant BRIEF Scale, Index and GEC T-scores by Sex (M/F), Educational Classification (General, Special, Gifted) and Developmental Status (age group {5-6, 7-8, 9-13, 14-18})?

> Research question 2A: Is there a difference within the School District with respect to the incidence of clinically significant BRIEF Scale, Index and GEC T-scores by sex?
>
> Research question 2B: Is there a difference within the School District with respect to the incidence of clinically significant BRIEF Scale, Index and GEC T-scores by educational classification i.e. general vs. gifted vs. special education?
>
> Research Question 2C: Is there a difference within the School District with respect to the incidence of clinically significant BRIEF Scale, Index and GEC T-scores by age group (5-6, 7-8, 9-13, 14-18)?

Research Question 3: Does analysis of the 8 BRIEF sub-scores confirm the two factors Behavioral Regulation and Metacognition in the School District data?

Hypotheses

Hypothesis 1: There will be no significant difference between the normative sample and the district sample in mean Scale, Index and Global Executive Composite T-scores by sex (M/F) or age group (5-6, 7-8, 9-13, 14-18).

Hypothesis 2A: There will be no significant difference within the school district in the incidence of clinically significant Scale, Index and GEC T-scores by sex.

Hypothesis 2B: There will be a statistically significant difference within the school district in the incidence of clinically significant Scale, Index and GEC T-scores of students in general, gifted and special education categories.

Hypothesis 2C: There will be no statistically significant difference within the school district in the incidence of clinically significant Scale, Index and Global Executive Composite T-scores by age group (5-6, 7-8, 9-13, 14-18).

Hypothesis 3: The eight clinical scales; Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor, will be reliable indicators of the two index scores; Behavioral Regulation Index (BRI), Metacognition Index (MI) in the School District data.

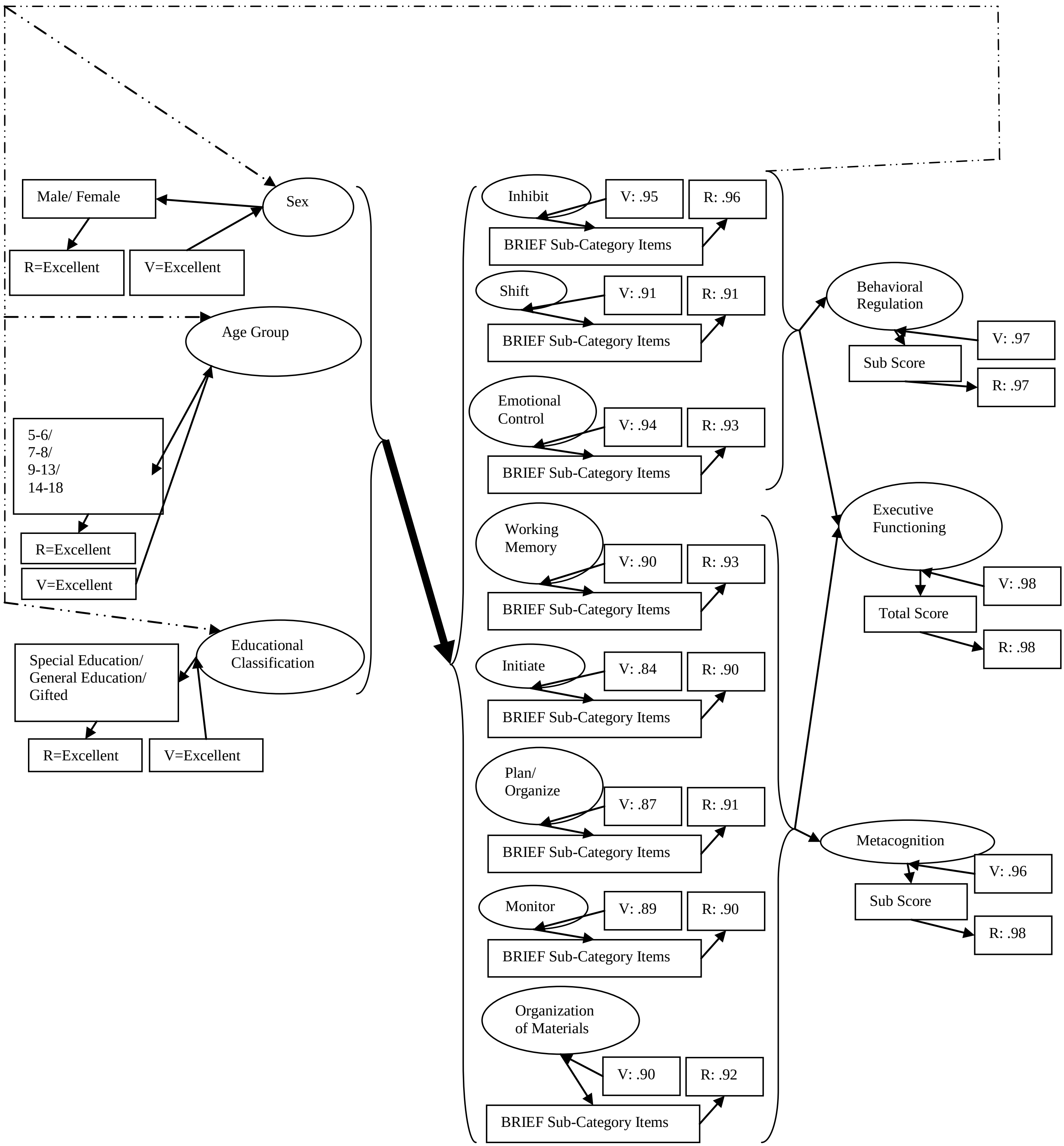

Figure 1. Latent variables of sex, developmental status and educational classification by BRIEF scales, indexes and global executive composite.

Problem Significance

Executive functioning, a collection of cognitive processes that are responsible for guiding, directing, and managing behavior toward the pursuit of a goal-directed task, impacts nearly every aspect of a child's life (Barkley, 2001; Denckla, 2007). However, executive functioning originates primarily in the frontal lobes, one of the last parts of the brain to mature. The regions of the brain responsible for sensation seeking are 'turned on' first, but the regions of the brain for exercising judgment are still maturing. In addition, hormones exert a direct influence on seratonin and other neurochemicals that regulate mood and excitability, particularly in the limbic system. As a result, there is an increase in poor judgment and decision making when something is emotionally arousing or has high social impact (Fischer & Daley, 2007; Giedd, 2002; Gogtay et al 2004).

Brain development research indicates that humans achieve their maximum brain cell density between the third and sixth month of gestation. During the final months before birth, brain cells undergo a dramatic pruning. By the time a child is six, the brain is 90-95% of its adult size. Giedd (2004) determined that there is a second wave of proliferation and pruning that occurs later in childhood and the final critical part of this second wave occurs in the late teens. The thickening of gray matter peaks when girls are approximately eleven years of age, and boys at twelve and a half. The last area to develop and mature is the prefrontal cortex, home to executive functions. Giedd, et al. (1999) also found that the gray and white matter of the brain undergo extensive structural changes past puberty. Full frontal lobe development may not occur until the mid to late twenties. This indicates that there is a great deal of opportunity to make and strengthen connections throughout adolescence, in effect, altering the brain (Strauch, 2003). When children and adolescents perform tasks that require executive functioning skills, they rely on the prefrontal cortex to do all the work rather than distributing the workload to other specialized regions of the brain, providing critical opportunities to enhance learning and development of executive skills. Practice of executive skills to promote development of neural connections and brain structures should be done during these critical times (Dawson & Guare, 2009).

Given these findings regarding maturation and development related to executive functioning, it seems likely that there will be a plethora of executive function difficulties in the entire population. Research has linked executive functioning deficits with ADHD (Kenaly, 2002; Mahone, Cirino, et al. 2002) and autism (Gilotty et al., 2002), and there are some suggested links to learning disabilities (Singer & Bashir, 2001; Warner, Schumaker, Alley, & Deshler, 1989; Zera & Lucian, 2001). However, most of the research done with executive functioning has been with specialized populations and not with general education students. Based on the relatively low numbers in the normative sample (720) of the Behavior Rating Inventory of Executive Function (BRIEF) Teacher Form, an examination of an entire school district provides a great deal of data about executive functioning as it relates not just to specialized populations, but to general education as a whole. Data are compared across a significant age span by examining a school district from K-12, which also expands the research base. It is expected, given previous research, that there will be a large number of executive functioning deficits in the middle school population, in all categories (Wallis, Miranda, & Rubiner, 2005). Results of this research will help make informed and appropriate curriculum and intervention decisions.

While maturation remains the primary remedy for executive dysfunction, there are a multitude of external supports and accommodations that can be used to help a child with executive function deficits become more successful in the classroom. Awareness of executive functioning and knowledge of appropriate interventions could significantly improve the likelihood of implementation of such interventions. As an example, a five week program of executive function based interventions between five groups of parents and adolescents with ADHD using a go-plan-do-review routine resulted in improvements in getting homework and chores done and improving behavior (Debonis, 1998). Marlowe (2000) found that the two most important interventions were to teach children to think routinely and to think systematically:

> Adaptive thinking skills can be systematically taught to some children in a controlled setting with a high degree of environmental support. To be adaptive, the thinking process must teach strategies for discriminating between familiar and novel tasks and cause and effect relations. It also requires strategies for planning, decision making, prioritizing, and tune estimation (which is one skill that is necessary for task prioritization and time management.) Once a student has learned a series of specific procedures for adaptive or executive thinking, he or she can often use procedures to inhibit impulsive behavior. By using a system, the child can often concretely carry out the steps rather than simply acting without thinking in a systematic fashion (p 59).

Because of the No Child Left Behind (NCLB) legislation, school administrators and teachers are under a great deal of pressure and scrutiny to meet state benchmarks. Students also feel the pressure to perform on state assessments. Executive functions play a significant role in students' abilities to perform well on such measures. "Well developed executive functions allow us to organize our behavior over time and override immediate demands in favor of longer-term goals. Through the use of these skills we can plan and organize activities, sustain attention, and persist to complete a task. Executive skills enable us to manage our emotions and monitor our thoughts in order to work more efficiently and effectively" (Dawson & Guare, 2004, p.1).

Now that advances in brain measurement technology have enabled us to study not just the structure of the brain, but brain functions in action, our knowledge of brain development has significantly increased. Since the prefrontal cortex, the last region of the brain to mature, reaches maturity in the mid to late twenties for females and later for males, it is likely that evidence of executive dysfunction would be demonstrated frequently in the school setting (Hunt, 2004; Souchay & Isingrini, 2004).

The extent of executive dysfunction in a whole school setting is unknown at this time, because research has concentrated on small groups of individuals with diagnosed disorders. No studies of executive function have been done on a large scale using general education students, with the exception of the normative sample of the Behavior Rating Inventory of Executive Functioning Skills (BRIEF). This study will examine teachers' perception of the level of executive function in a school district in order to determine the prevalence of executive dysfunction and potential need for consideration of executive function as a factor in curriculum development and educational organization.

Definitions

<u>Behavior Rating Inventory of Executive Functioning Skills (BRIEF).</u> This is an 84-item rating inventory completed by classroom teachers. It enables professionals to assess executive function behaviors of a broad range of children, ages 5 to 18 years. The BRIEF contains 86 items within eight theoretically and empirically derived clinical scales that measure different aspects of executive functioning: Inhibit, Shift, Emotional Control,

Initiate, Working Memory, Plan/Organize, Organization of Materials (which will be referred to as Organization of materials in the analysis), and Monitor. Copyrights are 1996, 1998 and 2000 by Psychological Assessment Resources. Authors are Gerard A. Gioia, PhD, Peter K. Isquith, PhD, Steven C. Guy, PhD, and Lauren Kenworthy, PhD.

Executive Dysfunction, Executive Function Impairment, Executive Function Deficits: These terms are used interchangeably for the purposes of this research and are defined as a collection of cognitive processes that are responsible for guiding, directing, and managing behavior toward the pursuit of a goal-directed task

Executive Function: A student's set of related capacities for intentional problem solving that include initiation, inhibition, shift, emotional control, working memory, plan/organize, organization of materials and self-monitoring, as measured by the BRIEF, using teachers' perceptions.

Metacognition: A child's ability to self-manage a task for the purpose of completing a goal-directed activity as measured by the BRIEF using teachers' perceptions.

Developmental Status: The student's chronological age.

Sex: Male or Female

Educational Classification: A student's academic functioning level as identified by the school as Gifted or receiving Special Education services, or in general education.

- *Special Education*: A child identified to have a disability under Chapter 14 Pennsylvania Regulations and Federal Regulations Part 300, with the exception of Speech Impairment.
- *Gifted:* A child identified as meeting PA Chapter 16 criteria for Giftedness. Mentally gifted is defined as outstanding intellectual and creative ability the

development of which requires specially designed programs or support services, or both, not ordinarily provided in the general education program. This includes a measured intellectual quotient of 130 and/or multiple criteria strongly suggesting gifted ability. (22 Pa. Code §16.1)

- *General Education*: A student who does not receive Chapter 14 or Chapter 16 services.

Functional Magnetic Resonance Imaging (fMRI): is a type of specialized MRI scan. It measures the haemodynamic response related to neural activity in the brain or spinal cord of humans or other animals. It is one of the most recently developed forms of neuroimaging. Since the early 1990s, fMRI has come to dominate the brain mapping field due to its low invasiveness, lack of radiation exposure, and relatively wide availability.

Assumptions

The following statements are assumed to be true for this research.

- The teachers who rated the students were sufficiently knowledgeable to effectively rate the students.
- Teachers responded in a meaningful way to the test questions.
- Executive functioning scores reflect students' executive functioning.
- There is no significant difference between direct measure and teacher perception of executive function as measured by the BRIEF.

Limitations

In the data, although a large portion of the student body was rated, parents were able to opt out of the initial data collection. As a result, 1119 of the 1334 students were rated. This self-selection may have had an impact on the sample if the students who were opted out displayed executive function behaviors that were significantly dissimilar from the rated population.

These data are applicable to schools whose demographics closely resemble those of this school sample, which is 98% white, 95% middle socioeconomic status and rural, based on 2000 census data. Results may not be generalizable to other schools with differing characteristics.

For the initial data collection, each student was rated by one teacher. At the elementary level, the teacher saw the student in all settings and could therefore more globally and more effectively rate her or him. At the middle and high school, the teacher who rated the student saw that student for at least one class. This does not allow for time of day or class type variation. Therefore, if a student was rated by a morning class teacher and showed significant problems in the afternoon, the rating would be an underestimate of executive function difficulties and vice versa.

In terms of reliability and validity, the results should not be limited. Internal consistency coefficients are high, ranging from .90 to .98. Test retest correlations ranged from .83 to .92. There are two validity scales on the BRIEF, Inconsistency, which screens for an unusual or infrequent degree of inconsistency in rater response and Negativity, which screens for an infrequent pattern of high ratings, suggesting the possibility of excessively negative respondent ratings. Protocols that displayed clinically significant levels on any measure of validity were discarded.

CHAPTER II

LITERATURE REVIEW

Virtually all of the literature regarding the concept of executive functioning grew out of the field of neuropsychology (Barkley, 2006; Dawson & Guare, 2004; Lezak, 1995). Executive functions have been found to be important in successful adaptive living and have become a core component of neurological assessments (Manchester, Priestley & Jackson, 2004). Dr. Richard Gacka presented the following remarks at the Commission on Adult Basic Education (COABE) conference in 1996:

> "An argument can be made that all functioning (cognitive and effective) is neurological in nature and can trace its roots to electrical biochemical neurological events. Processes like "will", "want", "drive", "choice", etc., those things which we commonly consider to be simple concepts are complex neurological processes. A great deal of an individual's everyday functioning is monitored by an overriding "executive" or "managerial" process, a process that controls what, and how much, behavior is displayed. Much of the difficulty we see in adult clients can be traced to deficits at this executive or managerial level-deficits which may well be neuro-affective events which we commonly call "will", "intention", "want", "desire", or "drive". Much of the inappropriate, ineffective, or dysfunctional learning and behavior that we observe in adult education can be traced to deficits at this higher order cognitive level." (as cited in McAtee, p. 4, 1999)

Recent advances in brain imaging, particularly functional Magnetic Resonance Imaging (fMRI) research, have provided insight into the development of the brain from childhood to adulthood (Giedd, Blumenthal, et al.1999; Gogtay, Giedd, Lusk, Hayashi, Greenstein, Vaituzis, Nugent, Herman, Clasen, Toga, Rapoport, & Thompson, 2004). This research indicates that executive control may be separated into distinct functions performed by discrete cortical regions (Fassbender et al., 2004). This longitudinal research is still ongoing, but it presents exciting information about the development of the brain and makes interesting correlations between behaviors and brain development.

Executive functions arise from the frontal lobe, one of the last parts of the brain to mature (Fassbender, et al. 2004). Previous research has indicated greater executive function difficulty in special education populations than general populations (Hooper, Swartz, Wakely, deKruif, & Montgomery, 2002). Executive functions, by nature, are assumed to be better developed in those with higher cognitive levels (Hoffman, 2003). Boys also tend to have more executive functioning deficits than girls (Codding, Lewandowski, & Gordon, 2001).

Executive functions have increasingly become a focus of attention (Giedd, Blumenthal et al., (1999), Gogtay et al., 2004; Meltzer & Krishnan, 2007). The term executive function has been described as a set of related capacities for intentional problem solving that includes anticipation, goal selection, planning, monitoring, and use of feedback. Important aspects of the executive functions that relate to the highest levels of cognition are: anticipation, judgment, self-awareness, and decision making. Executive or directive cognitive control functions differ from more basic cognitive functions (e.g. language, visual-spatial, memory abilities) (Gioia, Isquith, Guy et al., 2000). These executive functions have been measured in small populations of children with specific disabilities and brain disorders (Culhane-Shelburne, Chapieski, Hiscock & Glaze, 2002). Specific deficits have been found in children with Attention Deficit Hyperactivity Disorder (ADHD) (Kenaly, 2002; Mahone, Cirino, et al. 2002), autism (Gilotty, Kenworthy, Sirian, Black & Wagner, 2002), learning disabilities (Zera & Lucien, 2001; Meltzer & Krishnan, 2007), and written expression difficulty (De La Paz, Swanson, & Graham, 1998). Recently, work with longitudinal studies of children and adolescents using fMRI technology has provided neurological information about the brain's development, which provides a basis for developmental levels of executive functioning in the middle and high school years (Gogtay et al., 2004). This recent work has been conducted on typical students, while most of the executive functioning research has been conducted on those with a disability or disorder and compared to typical students. This new research has significant implications for education.

Research on executive function is found in medical, neuropsychological and educational domains. This review is organized into research on the relationship of executive function and ADHD, school and clinical populations, age and sex, and giftedness. Also included is research on potential outcomes of executive dysfunction such as substance use, dropout behavior and incarceration.

Executive Function and Attention Deficit Hyperactivity Disorder

ADHD is the most common and most studied psychiatric disorder of childhood, affecting approximately five percent of school aged children (Mahone & Silverman, 2008). Executive function impairments have been most frequently linked to ADHD (Barkley, 1997; Laurence, 2008; Lawrence, et al. 2004; Pratt, 2000). In fact, executive functions characterized by poor self-regulation and behavioral inhibition are suggested to be the cardinal impairments in ADHD (Codding, Lewandowski, & Gordon, 2001).

Longitudinal fMRI studies have shown that children with ADHD reach maturation two to five years later in prefrontal brain areas, but slightly earlier than their peers in primary motor areas, suggesting that atypical brain development in these children drives excessive motor activity and fails to inhibit inappropriate impulses (Mahone & Silverman, 2008). ADHD symptoms and executive functioning impairments have also been found to be early predictors of problem behaviors (Wahlstedt, Thorell &

Bohlin, 2008). Executive functions may tap an individual's self control in the areas of control of motor, memory, attention, motivation, and/or planning functions. Therefore, executive functions are important factors to consider when assessing characteristics of ADHD and in intervention planning (Codding et al, 2001).

ADHD is conceptualized as a disorder of inhibition and self-regulation or executive functioning. An executive function is a major type of action we direct toward ourselves (Barkley, 2001). In a 2004 presentation in Lancaster, Pennsylvania, Russell Barkley presented four executive functions, or stages of self-control. They are:

1. Nonverbal: Primarily visual imagery, the replaying of sensory events.
2. Vygotsky's concept of self-speech; that language would not be possible if not for noises and images.
3. Emotion to self: Calling forth an image to produce an emotion. A motivational state, which is the source of all intrinsic motivation; persistence; willpower.
4. Reconstitution fluency. Two interacting processes characterize this system: analysis and synthesis.

Executive functions are responsible for coordinating the activities involved in goal completion such as anticipation, goal selection, planning, initiation of activity, self regulation, deployment of attention, and utilization of feedback (Anderson, Anderson, Northam, Jacobs and Mikiewicz, 2002). The researchers report that these processes are at the "heart of all socially useful, personally enhancing, constructive and creative activities" (p. 24).

The prevalence of executive function difficulty in a school population is likely to be underestimated. It is estimated that there are at least two children identified with

ADHD in any typical elementary school class (Mahone & Silverman, 2008). There are likely many more who exhibit symptoms of ADHD. A growing number of students have been noticed who seem to struggle in school because of weaknesses in executive skills even when they do not meet the diagnostic criteria for ADHD or another disorder (Dawson & Guare, 2004).

Executive Function in Clinical and School Populations

With the development of the Behavior Rating Inventory of Executive Function (BRIEF) (Gioia, Isquith, Guy et al., 2000), researchers have distinguished executive functioning deficits utilizing teacher ratings in a variety of disorders relating to children, both in clinical and school settings. Gioia, Isquith, Kenworthy and Barton (2002, p. 45) report that "extant research offers some insights into different profiles of executive dysfunction among groups of children with developmental and acquired disorders including ADHD, Reading Disorders, Traumatic Brain Injury (TBI), and Autism Spectrum Disorders."

Executive function deficits have been found to have a deleterious effect on learning. Specifically, deficits in attention, working memory and executive function can have a direct and severe effect on learning (Wong, 1991). It would then seem that executive function should be a commonly assessed area of functioning due to this significant relationship with the majority of learning disabilities, but researchers have found that it is not (Pennington, 1990; Stein & Krishnan, 2007).

Students with learning disabilities lack executive control and self-regulation in learning, as they often have difficulty selecting appropriate strategies for problem solving in reading comprehension, analytical reasoning, and mathematics (Roditi & Steinberg, 2007). Barriers faced by students with learning disabilities in making effective choices and decisions include: not acknowledging their disability; poor understanding of themselves, learned helplessness, a tendency to be make self deprecating attributions; inappropriate or ineffective socialization skills; and difficulty in executive functioning skills (Hoffman, 2003). Difficulty in corrective processing, whether or not concurrent task performance impairs executive functioning, is also a common characteristic (Macrae, Bodenhausen & Schloerscheidt, 1999).

Executive function deficits can effect functioning in core elements of the curriculum, reading, writing and mathematics, and essential skills measured by standardized tests. Teachers, schools, and students are assessed by the results of these high stakes measures (Meltzer & Krishnan, 2007). Poor executive functions are found to predict risk for literacy delays, literacy progress rate and future reading performance (Johnson, 2008).

Impairments in executive abilities have also been found to be associated with the deficits in communication, play and social relationships commonly present in students with autism (Gilotty et al., 2002; Ozonoff & Schetter, 2007). Executive functions and self-regulatory processes strongly influence language production. They are not routinely assessed in speech-language assessments and interventions, but some researchers have suggested that they be included as part of a comprehensive evaluation (Singer & Bashir, 2001).

Written expression is affected by executive function (Graham, Harris & Olinghouse, 2007). Deficits in executive functioning have been found in elementary school children with writing problems (De La Paz et al., 1998). NCLB requirements have brought increasing attention to the writing process, with pressure to increase student writing in the core academic domains (Hooper et al., 2002). This increase in student writing task demands has likely exacerbated writing difficulties for many students, whether or not they have been identified as having executive function concerns, as controlled attention is required for written expression (Graham et al., 2007). Researchers have also noted that attention works in concert with both working memory (Cherkes-Julkowski, Sharp & Stolzenberg, 1997) and executive functioning (Barkley, 1996; Zera & Lucian, 2001).

There has been some research into the differentiation of executive function by educational classification. Griffith (1993) used the Neuropsychological Symptom Inventory – Children's Revision (NSI-CR) to discriminate general education students from students who are identified with learning, achievement and emotional disabilities. His sample was 566 students from grades four through eight. Students were categorized based on their current classroom placement and consisted of 248 students from the general education population, 172 students identified as learning disabled, 69 students with low achievement, and 68 students identified as emotionally disabled. NSI-CR was able to discriminate special education groups with a 64% accuracy rate, 71% of general students, 66% of the learning disabled students, 51% of the emotionally handicapped students, and 48% of the low achieving students.

Recent studies in bullying behavior have found bullying to be correlated with measures of neuropsychological dysfunction and executive function deficits. A group of 41 middle school students (age range 11–15 years) identified as bullies by school administrators, their teachers, and self-ratings and group-matched controls were rated by their parents using the Coolidge Personality and Neuropsychological Inventory. Students identified as bullies were found to have more diagnoses of conduct disorder, oppositional defiant disorder, attention-deficit/ hyperactivity disorder, and depressive disorder (Coolidge, DenBoer & Segal, 2004). However, interventions of a short term, psychotherapeutic nature were judged to be of limited value given the complex nature of the associated psychopathology.

Some researchers have suggested a link between executive function deficit and procrastination (Manning, 2002; Manzo, 2005; Wilson, 1986). Stone (2000) found no link between executive function and procrastination; however, a correlation was found for conduct disorder, oppositional defiant disorder, ADHD, depression, and several personality disorders, specifically Axis II B disorders and executive functioning deficit. The BRIEF has also been used as a measure to associate Bipolar Disorder and executive functioning deficits (Shear, DelBello, Rosenberg & Strakowski, 2002).

Age, Sex and Executive Function

Executive function related to age has been assessed by several researchers, particularly since the development of advanced technology which has more accurately pinpointed physical brain development. Age dependent changes in children's performances on executive function tasks have been found by Brocki and Bohlin (2001). The measures included a go/no-go task, a verbal fluency task, a continuous performance task, a Stroop-like task, a hand movements task, and a digit span task. Analyses revealed three dimensions interpreted as Disinhibition, Speed/Arousal, and Working Memory/Fluency. Age and sex differences were analyzed for the delineated functions, and results represent age effects at the level of specific processes within the executive domain rather than on single tests. Age-dependent changes in children's performance on all three dimensions were demonstrated, with three particularly active stages of maturation: early childhood (6-8 years of age), middle childhood (9-12 years of age), and during early adolescence. Sex differences were only found for the speed/arousal dimension (Brocki & Bohlin, 2004).

Early emphasis on executive function is important, because executive functions and theory of mind can be taught to preschoolers (Kloo & Perner, 2008). Affective decision making has been found to develop quickly during the preschool period, possibly reflecting the growth of neural systems involving the orbitofrontal cortex (Kerr & Zelazo, 2004). There is some indication that programs that address executive functions can make a difference in education at the 3-4 year old level, even though developmental functions have not matured (Jacobson, 2008). In addition, relational abilities develop before classificatory abilities in prekindergarten children to second graders (Hooper & Sipple, 1975). No sex differences have been found in the development of logical operations or matrix tasks, but grade level has been found to be significant between kindergarten, third and sixth graders in the development of logical operations (Hooper, 1975).

Since 1970, researchers have found that it was critically important to take into account the developmental status of the curriculum target population when making educational interventions (Hooper, 1970). Play activities, social interactions, peer group processes and self initiated active involvement have been found to be crucial in intellectual development (Hooper & DeFrain, 1980). Age related maturational components were found to be important considerations in any curriculum to attempt to modify the course of cognitive development. Recent research continues to suggest the need for a developmentally appropriate program with a strong emphasis on play, which enhances learning and development to improve both social and academic success of young children (Jacobson, 2008). It is also important to be responsive to research developments and their educational implications (Johnson & Hooper, 1982). With rapidly evolving technology and knowledge, responsiveness is recommended to be rapid as well (McKenney & Voogt, 2009).

Children's ability to perform well on tasks of executive ability during the first and second grade predicts change in their level of behavioral problems over a two-year period (Riggs, Blair & Greenberg, 2003). Riggs et al. (2003) postulate that there may be a developmental lag between children's acquisition of neurocognitive capacities and the behavioral patterns associated with them. They also found that impaired neurocognitive abilities might place young children at risk for developing behavior problems. Their research also led them to suggest that the BRIEF be used to measure executive function in first and second grade children. These researchers reported that traditional behavioral checklists were not adequate in defining the essence of executive function deficit at that age.

Children who were born very premature or with extremely low birth weight (ELBR) have been found to be at greater risk of executive function deficits. Anderson and Doyle (2004) found that when ELBR children were eight years of age, they exhibited significant executive functioning deficits compared to normal birth weight eight year olds.

Studies on the development of executive functioning do not provide consistent data on sex effects. There are different developmental trajectories depending on type of executive function. However, results could perhaps be ascribed to sex differences in response style (Brocki & Bohlin, 2004). ADHD research has indicated that identified boys tend to have more apparent executive dysfunction in school than identified girls and nonidentified boys (Berlin, Bohlin & Rydell 2003). In general, most of the research that addresses executive function has been conducted on boys with ADHD (Raven, 2001; Barkley, 2004). Therefore, further research involving females and sex differences in executive function is needed (Brocki & Bohlin, 2004).

Executive Function and Giftedness

Giftedness has been found to influence the psychological well being of individuals and enhances resiliency (Neihart, 1999). Gifted students are, by their high cognitive levels, expected to have little executive functioning difficulty. Research has consistently found that students identified as gifted are as a whole, socially and emotionally well adjusted. Gifted students have also been found to have fewer behavior problems than their non-gifted peers. If gifted adolescents do encounter social problems and need help with executive functions, it is on a level similar to their non-gifted peers (Willis, 2007).

Gifted students are often described as asynchronous (Genshaft, 1995). This term describes the uneven development of gifted children in the intellectual, social and physical areas. Research suggests that the highly gifted, those with IQs three standard deviations above the mean, are most at risk for peer-related problems (Pfeiffer, 2001).

Five traits common to gifted children have been identified that may result in social and emotional vulnerability: divergent thinking ability, excitability, sensitivity, perceptiveness and entelechy. They may appear disorganized and absent minded, have difficulty with organization, setting priorities and making decisions. In addition, they may appear to be rebellious, unmotivated, and inattentive and disaffected (Lovecky, 1992). These children often have difficulty finishing projects as they become fascinated by new subjects and/or lose interest in the boring details of projects.

Perfectionism is a personality trait that is often overlooked when working with gifted children (Silverman, 1995). Insistence on perfection inhibits many types of risk taking, particularly where the child feels she or he has less proficiency (Silverman, 1993). Some gifted children may place unrealistic pressures on themselves to perform. In the classroom, they may not attempt tasks or activities they do not think they can excel in, or may not finish projects. They may develop problems in accepting their own shortcomings as well as experiencing unrealistic reactions to failure (Gridley, 2001). Examples of perfectionistic behaviors are: procrastination or delayed engagement in assignments to be evaluated, delay in assignment completion, repeatedly starting over on assignments, or refusal to turn in completed assignments; unwillingness to volunteer, share work, or participate unless certain of the correct response; dichotomous thinking or inability to tolerate mistakes; unrealistically high performance standards; impatience with others' imperfections, and overly emotional reactions to relatively minor situations (Nugent, 2000).

The junior high or middle school years are important regarding attendance and achievement (Lounsbury, 2000). It is a critical time when patterns of achievement become established (Manning & Saddlemire, 1996). Adjustment problems tend to increase and self-perceptions of competency decrease in middle school (Peterson & Colangelo, 1996). Peer acceptance becomes of primary importance in adolescence

(Roeser, Midgley & Urdan, 1996). Underachievement for boys tends to increase in adolescence, particularly 7th grade. In fact, gifted boys outnumber gifted girls in school underachievement, and male students are more likely than female students to become extreme underachievers, and most underachievers are chronic underachievers. (Peterson & Colangelo, 1996). This may result in some underachieving gifted students appearing as if they have difficulty with executive functions.

Some gifted girls may also be at risk of not realizing their full potential. They need to develop the ability to monitor their own learning and to be an autonomous learner. Affecting the motivation pattern of gifted girls and their faulty perceptions of their own abilities is important to make progress in helping them develop their potential (VanTassel-Baska, 2008). Metacognition, a facet of executive functioning, often contributes to the high levels of performance demonstrated by gifted students (Hannah & Shore, 1995). Researchers suggest they should be explicitly taught (Gaskins, Satlow & Pressley, 2007).

Of those few researchers who have specifically addressed executive function and giftedness, results are not consistent. In a recent study of second graders, executive function was not found to be a predictor of giftedness, and there was no difference in those students who were identified as gifted and those who were referred for evaluation and did not qualify in executive functioning using one measure, the Tower of London, a problem solving task using pegs and colored beads (Mueller, 2008). Other researchers suggest that executive function is a characteristic of giftedness and should be a component of gifted evaluation as an aspect, or additional measure, of intellectual ability (Gallagher, 2007).

Executive Function and Behavior

Problem behaviors can begin early in life and are strongly associated with executive function (Hughes & Ensor, 2008). Children with disruptive behaviors have been found to have deficits in frontal lobe and executive functioning (Taylor, 1999). Studies have found that adolescents with disabilities are disproportionately incarcerated (Leone, 1991). Learning disabilities and mild mental retardation are overrepresented in incarcerated populations (Casey & Keilitz, 1990). Youth with a specific learning disability or an emotional disturbance are more vulnerable to placement in juvenile or adult corrections than youth not identified as disabled. Thirty two percent of youth in juvenile corrections have disabling conditions, compared to 9% of school age children (Quinn, Rutherford & Leone, 2001). Reduced executive function abilities in the areas of impulse control, cognitive flexibility and planning ability have been found in those who have committed domestic violence (Mintz, 2008).

Some children with behavior problems are also high functioning. Harvey and Seeley (1984) assessed 114 delinquent youths with the WISC-R, WAIS, WRAT, and Torrance Tests of Creative Thinking. They found 18% of their sample was gifted in some way. Several subjects were just below the gifted cutoff and a sizeable proportion scored in the extreme highest category of ability. These students differed from typical adolescents in that they had very high abilities in the area of fluid intelligence and did less well on achievement tests. They were not likely to have been identified as gifted in school. However, in general, delinquency is negatively correlated with intelligence level (Reichel, 1987), and intelligence level and success in school are likely to protect at risk students from delinquent behavior (Kandel, Kirkegaard-Sorenson, Hutchings & Mednick, 1988).

In terms of intervention and treatment, Watson and Westby (2003) reported that some children with executive function difficulty can learn to compensate for their learning and behavior problems if they are specifically taught the appropriate cognitive, academic and social behaviors. Other children may require some life-long external supports to perform appropriately. Success in educational, vocational and social pursuits depends heavily on effective self regulation of cognitive and social support behaviors (Ylvisaker & Feeney, 2002). Because executive dysfunction occurs as a result of the interaction between the child and environment, performance can be substantially improved by providing appropriate and effective accommodations by creating an environment that reduces unnecessary or tangential demands (Mahone & Silverman, 2008).

Promoting a positive learning milieu for children requires expert management of their social and physical environment (Worthington, 2003). Greater emphasis on the development of problem solving and strategic thinking could improve the quality of learning, particularly because declarative knowledge changes so quickly, according to Marlowe (2003). This model would be appropriate for use to facilitate self-regulatory behavior and metacognition in individuals without identified disorders of executive function (Marlowe, 2003). Continued support for the need for the consideration of executive functioning needs in a widespread school intervention model has been expressed (Daunic, Smith, Robinson, Landry & Miller, 2000). A great deal of research on metacognition and educational applications exists (Anderson, Nashon & Thomas, 2009). A schoolwide curriculum for teaching metacognitive strategies that address executive function processes has been developed (Gaskins & Pressley, 2007). Therefore, research based interventions are readily available for application.

Executive Function and Substance Abuse

The issue of alcohol and other drugs and their effect on executive functioning has been explored. It has been found that prenatal exposure to both alcohol and other drugs (Giancola, 2000; Watson & Westby, 2003), including nicotine (Barkley, 2002), results in executive function deficits. Poor executive function has been linked to greater endorsement of risky activities, an over emphasis of the benefits associated with risky activities and a higher incidence of problems associated with excessive alcohol consumption. However, the relation of executive function deficit and risk of alcoholism is less clear (Weingartner, 2000). Poor executive function also predicted greater participation in cigarette smoking, fighting and arguing (Magar, Phillips & Hosie, 2008).

Executive deficits are not part of the highest risk, antisocial pathway to alcoholism, but some executive function weaknesses may contribute to a secondary risk pathway (Nigg, et al. 2004). With increasing numbers of children being exposed in utero to these pathogens and a large number of children surviving due to medical advances and technology, there seems to be an increased incidence of children with disorders of executive functioning (Barkley, 2004). “Whether this is an artifact of greater awareness versus a higher incidence of children with neurobehavioral disorders surviving is not clear. Nevertheless, there needs to be a concomitant emphasis on therapeutic intervention in both school and clinical settings” (Marlowe, 2003, p.115).

There are few empirical comparisons exploring the multi-domain executive profiles of diagnostic groups other than ADHD (Vriezen & Pigott, 2002). Executive function deficits are seen in many acquired and developmental disorders. There is increasing evidence to suggest that different disorders may have unique executive profiles that can be helpful in fully developing a diagnostic picture and developing interventions that take into account the specific executive deficits (Gaskins, Satlow & Pressley, 2007).

Executive Function and Dropout Behavior

Another significant concern in education is reducing dropout behavior of high school students (Wallis, 2004). While there have been a number of studies on dropout causality in high school, executive functions as a factor have not been explored (Azzam, 2007). Executive dysfunction has been addressed at the adult basic education level (Mcatee, 1999). It has been hypothesized that a possible causal factor in high dropout rates for adult education is deficiency in higher level executive regulatory skills (Levine, et al. 2000).

Research indicates that a great deal of the inappropriate, ineffective or dysfunctional learning and behavior observed in adult education can be traced to deficits at higher order cognitive levels (McAtee, 1999). It is suggested that executive dysfunction is an alternate way of viewing the apparent lack of intention or motivation (Manning, 2002; Manzo, 2005; Wilson, 1986). Given this finding, researchers postulate that these behaviors may also be linked to dropout behavior at the high school level. In a study of high school dropout behavior, Azzam (2007) found that the majority of students who dropped out said they were not motivated to work hard, but they would have worked harder had their teachers demanded more. In addition, 71% indicated that they started becoming distressed in high school as early as 9th and 10th grades.

Summary

New fMRI research indicates a window of opportunity at least through adolescence when synaptic development can be influenced by experience. Therefore, research of executive function in the general educational setting in order to identify potential areas of need is appropriate. One researcher has gone as far as to suggest that executive function education be embedded in the curriculum for all students despite little global research (Gallagher, 2007). Comparisons have been made in the literature using the BRIEF with many clinical populations, but no comparisons have been made with Gifted or Special Education populations. Several researchers have cited a need for studies of a wider range of students. Vriezen and Pigott (2002) suggested that future studies with the BRIEF involving a wider range of populations would also increase understanding of executive function in children, as well as the nature of deficits in executive function in specific clinical populations. Gioia, Isquith, Retzlaff, et al. (2002) suggest several future directions for the use of the BRIEF in terms of modeling executive function. They suggest examination of the BRIEF structure in the normative sample, possibly at several developmental points in time to contribute valuable information regarding the otogenetic development of executive functioning.

This literature review shows that there is strong empirical evidence that executive functioning is an integral part of learning and development. It is clear that executive functioning impacts education, functioning and development. The research literature on executive function has been primarily focused on those with neurological deficits and clinical disabilities. It has only been since the 1990's with advanced technology and fMRI that researchers have begun to gain information about the typically developing brain, and subsequently typically developing executive functions. Other than the BRIEF normative sample, there is no research which examines typically developing students' executive function. There is no research which addresses a whole district population and examines the variables of sex, educational classification or developmental status.

This study is important because it measures the executive functions of an entire school district using a behavior rating inventory, and compares among developmental status, sex and educational classification categories. Unlike previous research which looked at small groups and individual case studies (Vriezen & Pigott, 2002), this research provides an example of the level of executive functioning in a large group setting. It also provides an expansion of the research sample for the BRIEF. Increased knowledge of executive functioning as it relates to school district populations would illustrate student needs and provide a basis to direct specific interventions where needs are shown.

CHAPTER III

METHODS

This research uses archival T-Scores from the Behavior Rating Inventory of Executive Function (BRIEF) Teacher Version collected by a school district. Students were classified by sex, school grade and educational classification, i.e., general education, special education, or gifted. Of the population of 1334 students, 1119 were rated. Data were analyzed to determine the incidence of executive dysfunction**.** T-Scores were gathered from the following BRIEF indexes and composites: Global Executive Composite (GEC), the Behavioral Regulation Index (BRI), the Metacognition Index (MCI), and clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor). Each of these variables was reported in a standardized "T-score" metric (mean = 50, standard deviation = 10).

Design

This research uses archival data collected by a school district. This study was part Static Group Pre-experimental Design and part Correlational Research Design. The Static Group design allowed for the examination of group differences. Correlation is helpful in educational research because correlational studies identify which variables predict educational outcomes. Correlational research represents a general approach to research that focuses on assessing the covariation among naturally occurring variables. The goal is to identify predictive relationships by using correlations or more sophisticated statistical techniques. Results of correlational research also have implications for decision making, as reflected in the appropriate use of actuarial prediction. The greatest limitation of correlational research is the problem of interpreting causal relationships (Shaughnessy, Zechmeister & Sechmeister, 2002).

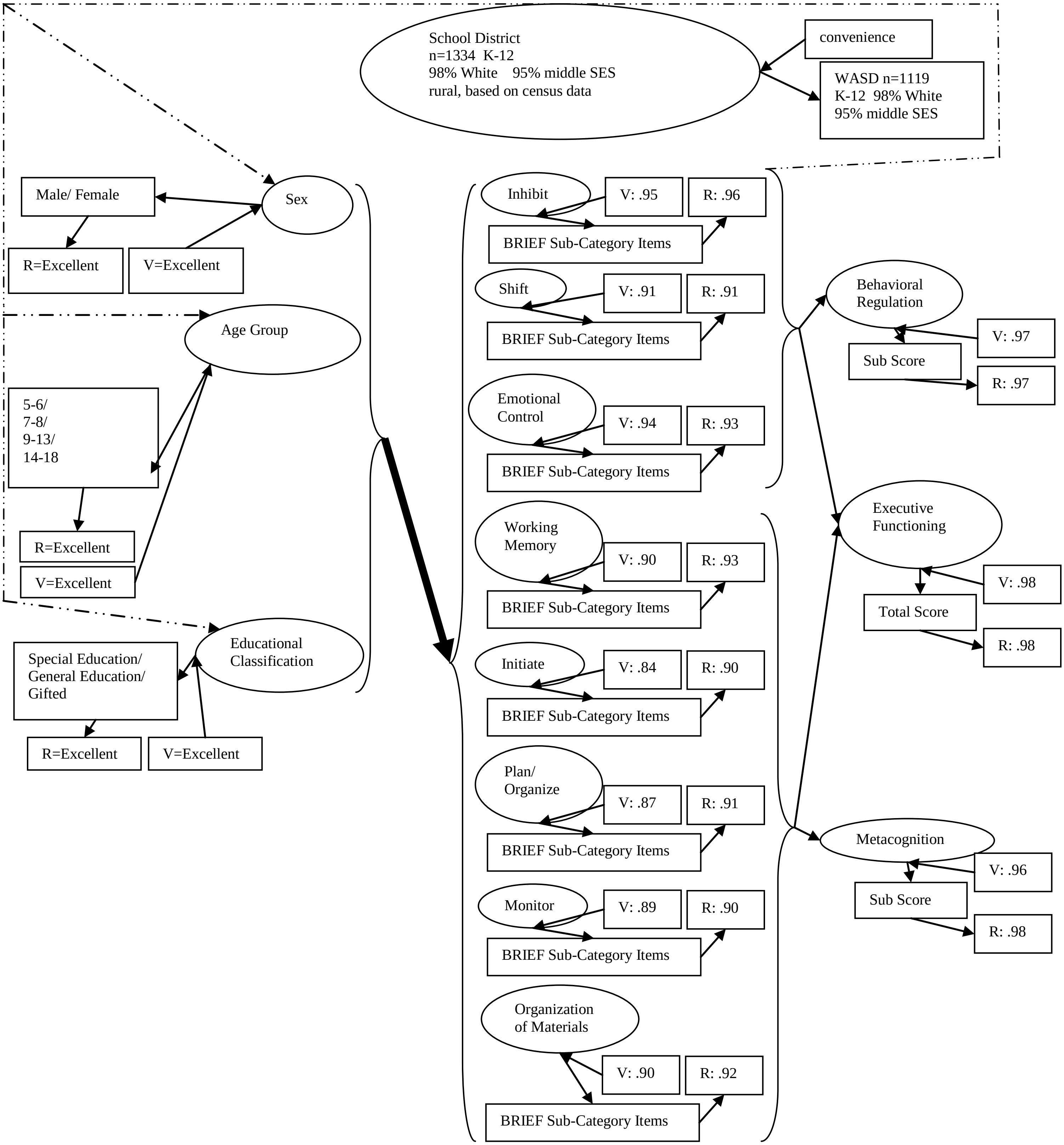

Figure 2. Research path diagram.

Population

This school district is located in western Pennsylvania. There are 1544 students enrolled in the district. Two hundred and ten of those students attend a school other than their home school (vocational-technical school, special education placement, alternative education placement, home schooling), resulting in an available population of 1334 students. Of that population, there are 287 students with Individualized Education Plans (IEPs) and 56 students with Gifted Individual Education Plans (GIEPs). Of the students with IEPs, 104 have Speech services, 190 have learning support services, 32 emotional support services, 10 autistic support, and 4 have life skills support. The district encompasses 111 square miles. There are three elementary schools, one high school, and one middle school. The district is rural, with a large farming community. The population of the town where the district administration, high, middle and one elementary school are located is 2706. The approximate number of families is 612. The US Census Bureau (2003 estimate) indicates a county population of 93,408, while the Pennsylvania population is 12,365,455. From the 2000 census statistics, the county population's ethnicity is 95% White, 3.6% Black or African American, 0.1% American Indian and Alaska Native, 0.3% Asian, 0.2% persons reporting some other race, 0.8% persons reporting two or more races, Hispanic or Latino 0.6%. Five percent of the county population speaks a language other than English at home. The county occupies 360 square miles and does not have a metropolitan area.

Sample

The sample for this research study is an anonymous archival database provided by the school district. The original collection is a convenience sample that encompasses those who agreed to cooperate from the entire attending population. Those who attended other schools or were placed outside of their home school were not included in the sample. The population size was small enough to be assessed without significant teacher time or disruption to the education process. Within the population, there were 220 students whose parents withheld permission. A total of 1119 students were rated. In the special education population, 19 students were not included because they attended the Vocational Technical School and 16 were in out of district placements. Four students who were in full time life skills in-district program were excluded from the sample as well. Students who had a Speech only IEP were not included in the Special Education subgroup. They were included in the general education population.

Assignment

Student assignment was predetermined based on educational classification (special education, gifted, general education), sex, and chronological age. Those students with speech only services were classified as general education. Students were designated to be rated by a teacher who had the student in at least one class and indicated that she or he knew that student sufficiently well enough to complete the rating scale. No additional assignment was used.

Measurement

This dissertation uses archival data collected by the school district during the 2005-2006 school year. The school district designated a portion of an in-service day to the collection of data. Each student was rated once by a teacher who had the student currently in a class and indicated that she or he knew that student sufficiently well enough to complete the rating scale. All students were rated using the Behavior Rating Inventory of Executive Functioning Skills (BRIEF) (Gioia, Isiquith, Guy et al. (2000).

This is an 84-item rating scale completed by classroom teachers. As Barkley (2001) noted, executive functioning skills should be evaluated within a social framework or context, as opposed to relying solely upon isolated test measures. This rating scale yields eight theoretical and empirically derived clinical scales that measure different aspects of executive functioning. These eight scales are combined to form two broad indexes, the *Behavior Regulation Index*, and the *Metacognition Index*, and finally an overall *Global Executive Composite*. The following description of each scale is based on the manual (Gioia, Isquith, Guy, et al., 2000).

1. Inhibition: This construct is measured by ten questions which assess the ability to resist an impulse and to stop one's own behavior at appropriate junctures. Internal consistency coefficients for the BRIEF Teacher Form for the Inhibit scale are .95 for the clinical sample and .96 for the normative sample.

2. Shift: This construct is measured by ten questions and assesses the ability to move freely from one situation to another as the circumstances demand. A key aspect of shifting includes the ability to change focus from one mindset or topic to another. Internal consistency coefficients for the BRIEF Teacher Form for the Shift scale are .91 for the clinical sample and .91 for the normative sample.

3. Emotional Control: This construct is measured by nine questions and assesses a child's ability to modulate a given emotional response within a classroom setting. Internal consistency coefficients for the BRIEF Teacher Form for the Emotional Control scale are .94 for the clinical sample and .93 for the normative sample.

Behavior Regulation Index: This index is measured by the aforementioned three constructs, and represents a child's ability to modulate emotions and behavior in the classroom via appropriate inhibitory control. Internal consistency coefficients for the BRIEF Teacher Form for the Behavior Regulation Index are .84 for the clinical sample and .90 for the normative sample.

4. Initiate: This construct is measured by seven questions and assesses behaviors relating to beginning a specific task or activity in the classroom. Internal consistency coefficients for the BRIEF Teacher Form for the Initiate scale are .95 for the clinical sample and .96 for the normative sample.

5. Working Memory: This construct is measured by ten questions and measures the capacity to hold information in mind for the purpose of completing a specific cognitive task or activity. Working memory is essential to carrying out multiple-step activities, complete mental arithmetic, and follow complex instructions. Internal consistency coefficients for the BRIEF Teacher Form for the Working Memory scale are .90 for the clinical sample and .93 for the normative sample.

6. Plan/Organize: This construct is measured by ten questions designed to measure a child's ability to manage future oriented task demands and complete long-term assignments. Internal consistency coefficients for the BRIEF Teacher Form for the Plan/Organize scale are .87 for the clinical sample and .91 for the normative sample.

7. Organization of Materials: This construct is measured by seven questions and measures orderliness of work, play, and storage spaces. Internal consistency coefficients for the BRIEF Teacher Form for the Organization of Materials scale are .90 for the clinical sample and .92 for the normative sample.

8. Monitor: This construct is measured by ten questions and is designed to assess work-checking habits and how effectively a child monitors their own behavior. Internal

consistency coefficients for the BRIEF Teacher Form for the Self-Monitor scale are .89 for the clinical sample and .90 for the normative sample.

Metacognition Index: This index is measured by the aforementioned five constructs and represents a child's ability to self-manage a task for the purpose of completing a goal-directed activity. Internal consistency coefficients for the BRIEF Teacher Form for the Metacognition Index are .96 for the clinical sample and .98 for the normative sample.

Global Executive Composite: This is a summary score that incorporates all eight clinical scales and represents overall executive functioning. Internal consistency coefficients for the BRIEF Teacher Form for the Global Executive Composite are .98 for the clinical sample and .98 for the normative sample.

The BRIEF was standardized using students from public and private school recruitment in urban, suburban and rural settings in the state of Maryland. A total of 25 schools were sampled, including 12 elementary, 9 middle and 4 high schools, with a small subgroup (18) of patients with traumatic brain injury at Case Western Reserve University in Cleveland, Ohio. This sampling was done by voluntary participation of children between the ages of 5 and 18 years with no history of special education or psychotropic medication usage and no more than 10% missing responses on the rating scale. Teachers completed rating forms for 720 children, 317 boys and 403 girls. See Table 1 for age breakdown. Ethnicity was: White – 455, African American – 85, Hispanic – 27, Asian/Pacific Islander – 45, and Native American/Eskimo – 2.

The BRIEF Teacher form was found to have high internal consistency, ranging from .84 to .98. Test-retest reliability correlations were high, ranging from .83 to .92. Multiple correlations were conducted using various clinical measures to display construct validity. Factor analysis was also conducted to determine factor loadings. A factor correlation of .62 was demonstrated, with a cumulative percentage of variance of 83%. In addition to objective measures of validity and reliability, the BRIEF has been generally cited and recommended by a multitude of professionals both formally and informally (Baron, 2000; DeFilippis, 2001; Denckla, 2002; Dawson & Guare, 2004; Barkley, 2006).

A reviewer of the BRIEF in Mental Measurements Yearbook concluded that the normative sample for the teacher form was not adequate in size and the use of only one state in the norming process weakens the norms, even though the authors' claim that Maryland has a full range of characteristics suitable for norming (Fitzpatrick, 2004). Given the relatively small number of students in the normative sample for the teacher form (720), it is postulated that the total general education population of a school district might not be reflected by the BRIEF’s normative sample. More executive functioning deficits may be seen in typical populations if a larger sample was collected. This examination of the general education population compared to its own group of special education and gifted populations may provide more insight into the executive functioning of general education students, as well as those specialized populations. There was no major effect of parent educational level, socioeconomic status, ethnic group, or the teacher’s length of time knowing the student. Confirmatory factor analysis by Gioia, Isquith, Retzlaff and Espy (2002) provides evidence for the validity of the BRIEF as a multi-dimensional measure of executive function based on its internal structure and consistency of the data-based model with theoretical models of executive functions. Reviewers suggest that although confirmatory factor analytic techniques have validated the authors' conceptualization of what is being measured, future studies on different samples are needed to further validate the model (Schraw, 2004). The BRIEF has been reviewed positively by multiple individuals for statistical and developmental soundness (DeFilippis, 2001; Baron, 2000), and for providing a complete picture of the daily executive functioning of children and adolescents (Donders, 2002; Mangeot, Armstrong, Colvin, Yeates & Taylor, 2002). See Table 2 for internal consistency coefficients.

Table 1

Normative Sample Sizes by Age and Sex for the BRIEF Teacher Form

Child's Age (years)	Boys	Girls	Total
5	8	12	20
6	24	17	41
7	46	41	87
8	30	43	73
9	34	38	72
10	21	33	54
11	42	66	108
12	31	49	80
13	34	38	72
14	25	24	49
15	13	21	34
16	4	6	10
17	5	14	19
18	0	1	1
Total	317	403	720

Gioia, et. al., 2000

Table 2

Internal Consistency Coefficients for the BRIEF Teacher Form

Scale/Index	Clinical Sample*	Normative Sample**
Inhibit	.95	.96
Shift	.91	.91
Emotional Control	.94	.93
Initiate	.84	.90
Working Memory	.90	.93
Plan/Organize	.87	.91
Organization of Materials	.90	.92
Monitor	.89	.90
Behavioral Regulation	.97	.97
Metacognition	.96	.98
Global Executive Composite	.98	.98

*n = 475. **n = 720.

Comparisons have been made in the literature using the BRIEF with many clinical populations, but no comparisons have been made with gifted or Special Education disabilities populations. Several researchers have cited a need for studies of a wider range of students. Vriezen and Pigott (2002) suggested that future studies with the BRIEF involving a wider range of populations would also increase understanding of executive function in children, as well as the nature of deficits in executive function in specific clinical populations. Gioia, Isquith, Retzlaff, et al. (2002) suggest several future directions for the use of the BRIEF in terms of modeling executive function. They suggest examination of the BRIEF structure in the normative sample, possibly at several developmental points in time to contribute valuable information regarding the otogenetic development of executive functioning. Multiple group comparisons might elucidate similarities and differences in the underlying structure of executive function in normally developing and clinical groups. See Table 3 for Executive Function Project Measurement Characteristics: Research Question, Latent Variable Names, Observed Categories, Instrument/source, Validity, and Reliability.

Table 3

Executive Function Project Measurement Characteristics: Research Question, Latent Variable Names, Observed Categories, Instrument/source, Validity, and Reliability.

Research Question	Latent Variable Name	Observed Categories	Instrument Source	Validity	Reliability
1. Is there a difference between the Norm Sample and the School District with respect to the mean Scale, Index and GEC Scores for girls and boys by age group?	Developmental Status, Sex, Educational Classification	Age groups, Male and Female General, Education	BRIEF	Excellent	Excellent Cronbach's alpha .98
2. Are there differences within the School District with respect to the incidence of clinically significant T-scores by Sex, Educational Classification and Developmental Status?	Developmental Status	Sex, Educational Classification and Developmental Status	BRIEF	Excellent	Excellent Cronbach's alpha .98
2A. Is there a difference within the School District with respect to the incidence of clinically significant T-scores by sex?	Sex	Male and Female	BRIEF	Excellent	Excellent Cronbach's alpha .98
2B. Is there a difference within the School District with respect to the incidence of clinically significant T-scores by educational classification i.e. general vs. gifted vs. special education?	Educational Classification	General, Gifted and Special Education Categories	BRIEF	Excellent	Excellent Cronbach's alpha .9
2C. Is there a difference within the School District with respect to the incidence of clinically significant T-scores by age group (5-18)?	Developmental Status	Age groups (5-6, 7-8, 9-13, 14-18)	BRIEF	Excellent	Excellent Cronbach's alpha .98
3. Does analysis of the 8 BRIEF sub-scores from the general population confirm the two factors Behavioral Regulation and Metacognition?	Executive Functioning	Behavioral Regulation Index Metacognition	BRIEF	Excellent	Excellent Cronbach's alpha .98

Procedures

This study was proposed to the school district by this researcher for use in a doctoral dissertation. The school staff received the proposal positively and requested to collect the data immediately. As a result the data collection was completed as a school district needs assessment project during the 2005-2006 school year independent from the dissertation project. Specifically, teachers completed the BRIEF March 17, 2006 during a teacher's in-service day. The researcher scored these protocols and transferred the data to a Microsoft Word document. This Microsoft Word document was given to the school district's information technologist who converted it to a de-identified Microsoft Excel file. Basic analysis and interpretation of the data were presented to the school board. The school then archived the file. Once the Indiana University of Pennsylvania Institutional Review Board approved the dissertation topic, the use of the de-identified Microsoft Excel file of BRIEF standardized scores was provided by the school district for the dissertation. No student names, identifying information or raw data were provided. See Table 4 for the Executive Functioning Project Task Table.

Table 4

Executive Functioning Project Task Table

#	Name	Description	Begin	End	Person
1	Project Idea	Design a study to examine the executive functioning skills of students K-12.	9/2/04	4/5/05	School Psychologist
2	Obtain School Staff Consent	Meet with superintendent and administrative staff to discuss study.	9/24/05	10/1/05	School Psychologist Superintendent Administration
2.	Obtain School Board Consent	Prepare powerpoint and present to school board members.	1/3/06	1/14/06	School Psychologist
3.	Obtain Materials	Order BRIEF forms. Pre-fill out demographic data on forms.	1/15/06	2/13/06	School Psychologist + Intern
4.	Hold Informational Sessions	Open sessions for parents and staff to discuss the project.	2/14/06	3/10/06	School Psychologist
5.	Rating	On school in-service day all staff are scheduled to complete the BRIEF rating forms. School Psychologist oversees rating and answers questions.	3/17/06	3/17/06	Teachers + School Psychologist
6.	Data Entry	BRIEF forms are entered into the computerized scoring software.	6/15/06	8/15/06	School Psychologist

# Name	Description	Begin	End	Person
7. Data Preparation	Data are copied from the computerized scoring software onto a word document. Categories and classifications are included with document. Once completed, the word document is sent to school district information technologist to be converted into a de-identified excel file.	9/18/06	9/28/06	School Psychologist + District Information Technologist
8. IRB approval	Approval of research topic, renewed after one year.	3/15/08	3/15/10	School Psychologist
9. Initial Defense	Defense of first three chapters to dissertation committee.	12/3/08	12/3/08	School Psychologist
10. Data Analysis	Receive de-identified student data.Check data. Examine data to determine if it meets the assumptions for analysis to be used. Run the analysis. Interpret analysis results.	11/1/08	5/15/09	School Psychologist
11. Report Preparation	Write report.	9/28/06	3/29/10	School Psychologist

Sample Size

The sample for this research study was obtained from the school district's entire population. The population size was small enough to be assessed without significant teacher time or disruption to the education process. Within the population, there was a portion of students whose parents withheld permission. A total of 1119 students were rated. In Kindergarten, 71 students out of a population of 94 were rated. In the first grade class, of a population of 97students, 79 students were rated. In second grade, 66 students were rated out of a population of 103. In third grade, 84 students out of a possible 118 were rated. In fourth grade, 91 of a possible 119 were rated. In fifth grade, 93 students were rated out of a population of 117. Seventy-nine students in sixth grade were rated out of a possible 103. In seventh grade, 90 students were rated of a possible 116. In eighth grade, 106 students of 111 possible were rated. In ninth grade, 91 students of 139 were rated. In tenth grade, 93 students of 114 were rated. In eleventh grade, 87 students of 104 were rated. In twelfth grade, 88 students of a possible 103 were rated. In the special education classification, there were 161 students rated of a population of 199. In the gifted population, 47 students of a possible 56 were rated using the BRIEF. See Table 5 for a complete listing of population and sample sizes.

Table 5

Population and Sample Sizes

Grade	Total Sample	Total Population	Sample Males	Total Males	Sample Females	Total Females	Sample Special Ed	Total Special Ed	Sample Gifted	Total Gifted
K	71	94	38	54	33	40	3	3	0	0
1	79	97	35	43	44	54	2	2	1	1
2	66	103	36	57	30	46	11	14	1	1
3	84	118	43	60	41	58	5	9	2	3
4	91	119	44	61	47	57	11	15	4	5
5	93	117	58	64	35	53	23	28	1	1
6	79	103	43	51	36	52	16	19	4	5
7	90	116	42	52	48	64	19	22	3	4
8	106	111	56	60	50	51	19	21	7	8
9	91	139	56	83	35	56	19	23	11	12
10	93	114	44	55	49	59	14	18	8	9
11	87	104	47	58	40	46	14	17	5	5
12	88	103	53	61	35	42	5	9	0	2
Total	1119	1334	595	759	524	678	161	199	47	56

Statistical Analyses

The subjects for this study are in the form of archival data described using descriptive statistics. Archival data are interval data, which has order and equal intervals. Data are linear, which allows statistical analysis to determine if there is a relationship between a response variable and possible predictor variables. Equal standard deviations occur in the data, which allows for statistical analysis. It is assumed that there is no difference between direct measures of executive functioning and teacher perception of executive functioning.

Using SPSS 16.0 and AMOS for Windows, inferential analysis determining basic group differences and interaction effects is calculated by way of multivariate analysis of variance (MANOVA). Inferential analysis determining basic group differences and interaction effects is calculated by way of analysis of variance (ANOVA). Individual T-tests are performed on the District and Normative samples. These procedures are performed on the Global Executive Composite (GEC), the Behavioral Regulation Index (BRI) and the Metacognition Index (MCI), and clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor). Post hoc tests are performed on ANOVAs to determine interaction effects. Confirmatory Factor Analysis (CFA) is performed on the BRIEF clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor). Each of these variables is reported as clinically significant (T-score of 65 or greater) or not clinically significant (T-score of 64 or less). An alpha level of 0.05 is employed in all statistical tests with the exception of the CFA, which uses a .004 alpha level.

Research question 1: Is there a difference between the norm sample and the school district with respect to the mean Scale, Index and GEC Scores for girls and boys by age group? It is hypothesized that there will be no difference in the school district Scale, Index and Global Executive Composite T-scores by sex than would be expected from normative data. The variables examined in this question are Age Groups (5-6, 7-8, 9-13, 14-18), Global Executive Composite (GEC), Behavioral Regulation Index (BRI), Metacognition Index (MI), and clinical scales; Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor. Individual T-test will be the statistical method of analysis. The assumptions which are checked are: Interval/ratio data, linearity, normality, and equal variance.

Research Question 2: Are there differences within the school district with respect to the incidence of clinically significant T-scores by Sex, Educational Classification and Developmental Status? There are three sub questions to research question 2. A. Is there a difference within the school district with respect to the incidence of clinically significant T-scores by sex? B. Is there a difference within the school district with respect to the incidence of clinically significant T-scores by educational classification i.e. general vs. gifted vs. special education? C. Is there a difference within the school district with respect to the incidence of clinically significant T-scores by age group (5-6, 7-8, 9-13, 14-18)? Multivariate analysis of variance (MANOVA) is the statistical method of analysis.

Research question 2A: Is there a difference within the school district with respect to the incidence of clinically significant T-scores by sex? It is hypothesized that there will be no significant difference in the incidence of clinically significant Global Executive Composite T-scores by sex. Multivariate analysis of variance (MANOVA) is the statistical method of analysis. Post hoc tests will be performed. The assumptions are: Interval/ratio data, linearity, normality, and equal variance.

Research question 2B: Is there a difference within the school district with respect to the incidence of clinically significant T-scores by educational classification i.e. general vs. gifted vs. special education? It is hypothesized that there will be a statistically significant difference in the incidence of clinically significant T-scores relative to educational classification. Specifically, special education students will have a higher incidence of clinically significant scores than gifted and general education students. The variables examined in this question are Educational Classification (general education, special education, gifted), Global Executive Composite (GEC), Behavioral Regulation Index (BRI), Metacognition Index (MI), and clinical scales: Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor. Multivariate Analysis of Variance (MANOVA) is the statistical method of analysis. Post hoc tests are performed. The assumptions are: Interval/ratio data, linearity, normality, and equal variance.

Research Question 2C. Is there a difference within the school district with respect to the incidence of clinically significant T-scores by age group (5-6, 7-8, 9-13, 14-18)? It is hypothesized that there will be no difference in the incidence of clinically significant scores within the school district relative to age group. The variables examined in this question are Age Group (5-6, 7-8, 9-13, 14-18), Global Executive Composite (GEC), Behavioral Regulation Index (BRI), Metacognition Index (MI), and clinical scales: Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor. Multivariate Analysis of Variance (MANOVA) will be the overall statistical method of analysis between groups. Analysis of Variance (ANOVA) is the statistical method of analysis within groups. Post hoc tests are performed. The assumptions are: Interval/ratio data, linearity, normality, and equal variance.

Research Question 3: Does analysis of the 8 BRIEF sub-scores confirm the two factors Behavioral Regulation and Metacognition? It is hypothesized that the eight clinical scales: Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor, will be reliable indicators of the two index scores; Behavioral Regulation Index (BRI), Metacognition Index (MI). Confirmatory Factor Analysis are performed using the variance-covariance matrix.

Table 6

Research Questions, Hypotheses, Variables, Statistical Analyses, and Statistical Assumptions

Research Questions	Hypotheses	Variables	Statistic	Assumptions
1. Is there a difference between the Behavior Rating Inventory of Executive Function (BRIEF) norm sample and the school district with respect to the mean Scale, Index and Global Executive Composite (GEC) T-scores for general population by sex (M/F) and age group (5-6, 7-8, 9-13, 14-18)?	Hypothesis 1: There will be no significant difference between the normative sample and the district sample in mean Scale, Index and Global Executive Composite T-scores by sex (M/F) or age group (5-6, 7-8, 9-13, 14-18).	GEC, BRI, MI, Individual scales, Sex, Age Groups	T-test	Interval/ ratio linearity normality equal variance
2. Are there differences within the school district with respect to the incidence of clinically significant T-scores by Sex, Educational Classification and Developmental Status?				
2A.Is there a difference within the school district with respect to the incidence of clinically significant T-scores by sex?	Hypothesis 2A: There will be no significant difference within the school district in the incidence of clinically significant Scale, Index and GEC T-scores by sex.	GEC, BRI, MI, Individual scales, Sex	MANOVA ANOVA Post hoc	Interval/ ratio linearity normality equal variance

Research Questions	Hypotheses	Variables	Statistic	Assumptions
2B. Is there a difference within the school district with respect to the incidence of clinically significant T-scores by educational classification i.e. general vs. gifted vs. special education?	Hypothesis 2B: There will be a statistically significant difference within the school district in the incidence of clinically significant Scale, Index and GEC T-scores of students in general and special education categories.	GEC, BRI, MI, Individual scales, Educational Classification	MANOVA ANOVA Post hoc	Interval/ ratio linearity normality equal variance
2C. Is there a difference within the school district with respect to the incidence of clinically significant T-scores by age group(5-6, 7-8, 9-13, 14-18)?	Hypothesis 2C: There will be no statistically significant difference within the school district in the incidence of clinically significant Scale, Index and Global Executive Composite T-scores by age group.	GEC, BRI, MI, Individual scales, Develop-mental Status	MANOVA ANOVA Post hoc	Interval/ ratio linearity normality equal variance
3. Does analysis of the 8 BRIEF sub-scores confirm the two factors Behavioral Regulation and Metacognition?	Hypothesis 3: The appropriate BRIEF sub-scales will load on their respective factors.	BRIEF Sub-scores	CFA	Interval/ratio Linearity Normality equal variance

GEC=Global Executive Composite; BRI=Behavioral Regulation Index, MI=Metacognition Index, MANOVA=Multivariate Analysis of Variance, ANOVA=Analysis of Variance, CFA=Confirmatory Factor Analysis

Summary

The fundamental purpose of this research is to determine the level of executive function deficits within a district, defining specific sex, educational classification and chronological age variables. One thousand one hundred nineteen student T-scores using the Behavior Rating Inventory of Executive Function (BRIEF) Teacher Version out of the population of 1334 were provided by the school district in the form of an anonymous excel file. Students' classifications were predetermined based on their sex, chronological age and educational classification (general education, gifted, special education). The excel file was analyzed using SPSS 17 for Windows. Individual T-tests are performed on the Global Executive Composite (GEC), the Behavioral Regulation Index (BRI), Metacognition Index (MCI), and clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor) of both the District Sample and the Normative Sample. A multivariate analysis of variance (MANOVA) statistic is performed on the Global Executive Composite (GEC), the Behavioral Regulation Index (BRI) and the Metacognition Index (MCI), and clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor). Analysis of variance (ANOVA) is performed on the Global Executive Composite (GEC), the Behavioral Regulation Index (BRI) and the Metacognition Index (MCI), and clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor) by age group, sex and educational classification. Post hoc tests are then performed. A Confirmatory Factor Analysis is performed using the variance-covariance matrix.

CHAPTER IV

RESULTS

This chapter details the results of the statistical analysis of one thousand one hundred nineteen student T-scores from the Behavior Rating Inventory of Executive Functioning (BRIEF) obtained from archival data provided by a rural public school in Midwestern Pennsylvania. The T-scores represent teacher perception of student executive functioning and are grouped into the areas of Global Executive Composite (GEC), the Behavioral Regulation Index (BRI) and the Metacognition Index (MCI), and clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor. Clinically significant T-scores (>65) were analyzed to determine the incidence of these scores in the population variables of sex, chronological age and educational classification to determine the significance of the incidence of clinically significant scores. Raw scores were compared with the BRIEF normative data to determine how closely the school district population represented the normative sample. A confirmatory factor analysis was also conducted to determine if the appropriate BRIEF sub-scales load on their respective factors.

Complications

Three complications were encountered during the data analysis. The first complication involved hypothesis one. The normative sample scores from the BRIEF manual were raw scores, while the school district data was represented in T-scores. The publishing company representative from Psychological Assessment Resources, Inc. (PAR) indicated that T-score normative data were not available. The representative suggested to retro-convert the database T-scores to raw scores using the conversion tables found in the BRIEF manual Appendix C on pages 117-129. This process was not difficult but was time consuming. Complication two occurred during the Confirmatory Factor Analysis. Examination of the dataset revealed that 5 of the 1119 participants (<.5%) had incomplete data on one or more of the items. Due to the large sample size, cases with missing data were deleted from all analyses. A third complication resulted from the sample size for Special Education age groups 5-6 and 7-8, and Gifted Education for all age groups and sex. These samples are so small as to preclude meaningful statistical analysis. As a result, an interaction MANOVA could not be completed. Conducting multiple separate MANOVAS and/or ANOVAS was not recommended due to the increased chance of Type 1 errors.

Computer Programs

The SPSS 17.0 for Windows program was used for the analysis.

Analysis

One thousand one hundred nineteen T-scores comprised the database. Five hundred ninety three (53.0%) were male and 526 (47.0%) were female. One hundred sixty (14.3%) were special education participants and 959 (87.5%) were not. Forty-seven (4.2%) of participants were gifted students and 1072 (95.8%) were not. Frequencies and percents for participants' grades are presented in Table 7.

Table 7

Frequencies and Percents for Participants Grade

Grade	Frequency	Percent
K	71	6.4
First	79	7.1
Second	66	5.9
Third	84	7.5
Fourth	91	8.1
Fifth	93	8.3
Sixth	79	7.1
Seventh	90	8.1
Eighth	106	9.5
Ninth	91	8.1
Tenth	93	8.3
Eleventh	87	7.8
Twelfth	88	7.9

Table 8

Descriptive Statistics for Age by Grade

				Age		
					Range	
Grade	n	Mean	S.D.	Median	Min	Max
K	72	6.1	0.4	6.1	5.5	6.9
First	79	7.1	0.4	7.1	6.5	8.0
Second	66	8.0	0.3	8.0	7.5	9.1
Third	84	9.1	0.3	9.2	8.4	9.8
Fourth	91	10.1	0.4	10.1	9.4	11.0
Fifth	93	11.0	0.4	11.1	9.5	11.9
Sixth	79	12.2	0.4	12.3	11.6	13.3
Seventh	90	13.2	0.4	13.2	12.3	14.4
Eighth	105	14.2	0.5	14.2	12.9	15.9
Ninth	91	15.0	0.7	15.0	13.0	17.1
Tenth	92	16.2	0.5	16.2	15.3	17.5
Eleventh	87	17.1	0.7	17.2	16.3	18.8
Twelfth	88	18.1	0.5	18.0	16.3	19.1

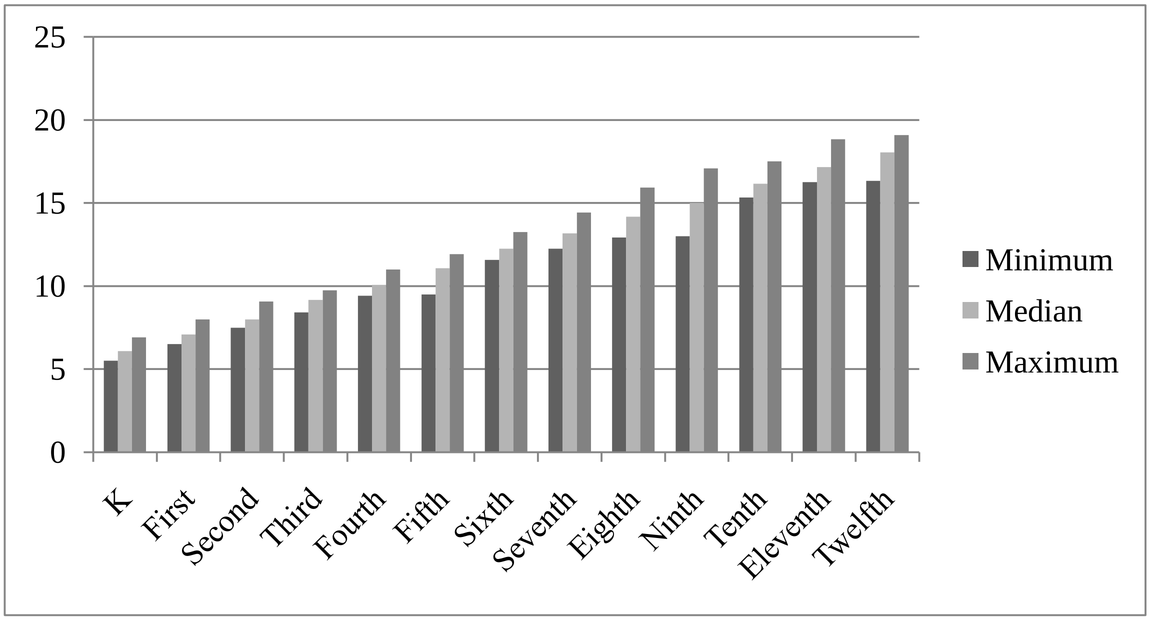

Figure 3. Bar graph with minimum, maximum and median age by grade.

Research Question 1

Question 1 examines the difference between the Behavior Rating Inventory of Executive Function (BRIEF) norm sample and the school District general education sample with respect to the mean Scale, Index and Global Executive Composite (GEC) T-scores for general population by sex (M/F) and age group (5-6, 7-8, 9-13, 14-18).

To examine Question 1, eighty-eight independent sample t-tests for males, females and their age group (5-6, 7-8, 9-13 and 14-18) were conducted to examine if differences exists with respect to scale/index subscales: Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). T-tests were used because co-variance data was not available for the Normative data from the publisher. The alpha level was .05 and a bonferroni adjustment was made by dividing .05 by the number of t-tests. The overall population was 1334. 1119 individuals participated in the study. This results in a 1.5% error rate with 99% confidence. Therefore, the overall sample is an appropriate number to reliably represent the population.

Eleven independent sample t-tests for males ages 5-6 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). The assumption of normality was met by checking the histograms visually for normality. Results indicated the assumption of normality was met. Stevens (1996) stated that samples over 50 approximate to normality; both the District and Normative groups met this sample size. For the homogeneity of variance assumption, the Districts' standard deviations were used for the Normative population, and thus they were equal to each other. The sample size of 29 out of a population of 97 yields a 15.2% error rate at the 95% confidence level. The results are presented in Table 9. An alpha level of .004 was used (.05 level divided by 11 tests). In these analyses there were no statistically significant differences on scales by group (Normative vs. District).

Table 9

Eleven t-tests for Scale/Index Subscales by Sample for 61 Males Ages 5-6

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max.	*t*	*r*	p
Inhibit	District	29	51.6	8.7	42	71	0.68	.08	0.50
	Normative	32	50.0	9.5	--	--			
Shift	District	29	50.7	8.1	42	67	0.58	.07	0.56
	Normative	32	49.5	8.0	--	--			
Emotional Control	District	29	49.2	7.0	43	68	0.63	.08	0.53
	Normative	32	50.5	8.8	--	--			
Initiate	District	29	52.4	10.8	39	73	0.82	.10	0.41
	Normative	32	50.2	10.1	--	--			
Working Memory	District	29	52.4	12.7	40	83	0.80	.10	0.43
	Normative	32	49.8	12.6	--	--			
Planning	District	29	51.6	11.2	38	75	0.47	.06	0.64
	Normative	32	50.3	10.3	--	--			
Organization/materials	District	29	53.6	11.8	42	84	1.36	.17	0.18
	Normative	32	49.5	11.8	--	--			
Monitor	District	29	53.9	12.2	39	81	1.16	.15	0.25
	Normative	32	50.1	13.2	--	--			
BMI	District	29	50.7	7.8	41	68	0.35	.04	0.73
	Normative	32	50.0	7.9	--	--			
MI	District	29	53.1	12.3	40	77	1.00	.13	0.32
	Normative	32	50.0	11.8	--	--			
GEC	District	29	52.4	10.5	40	76	0.91	.12	0.37
	Normative	32	50.0	10.2	--	--			

Note. *df* = 59

Eleven independent sample t-tests for males ages 7-8 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working

Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). For this set of analyses, a .004 alpha level was used. The sample size of 72 out of the population of 117 resulted in a 7.2 error rate at the 95% confidence level. The results are presented in Table 10 and revealed that Normative had a smaller mean on Organization of Materials ($p < .001$) compared to District. No significant differences were revealed on other scale/index subscales. The incidence of teacher perception of clinically significant executive function in the school District sample does differ from that of the Normative sample for males ages 7-8 on Organization of Materials. Seven to eight year old males are perceived by their teachers to exhibit more Organization of Materials difficulties than the Normative sample. This effect size of .58 is considered a medium effect size (Cohen, 1988). The population of District and Normative males ages 7-8 is not significantly different based on teacher perception of executive function with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Monitor, BRI, MI or GEC.

Table 10

Eleven t-tests for Scale/Index Subscales by Sample for 148 Males Ages 7-8

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max.	*t*	*r*	*p*
Inhibit	District	72	52.6	10.3	42	78	1.66	.14	0.10
	Normative	76	49.9	9.5	--	--			
Shift	District	72	50.9	8.3	42	81	0.78	.06	0.44
	Normative	76	49.8	8.9	--	--			
Emotional Control	District	72	51	10	43	79	0.31	.03	0.76
	Normative	76	50.5	9.6	--	--			
Initiate	District	72	53.7	9.6	39	75	2.38	.19	0.02
	Normative	76	49.9	9.8	--	--			
Working Memory	District	72	51.6	11.2	38	83	0.69	.06	0.49
	Normative	76	50.4	9.8	--	--			
Planning	District	72	52.3	11	38	79	1.42	.12	0.16
	Normative	76	49.7	11.3	--	--			
Organization/materials	District	72	52.7	9.9	42	83	8.64	.58	<.001
	Normative	76	38.7	9.8	--	--			
Monitor	District	72	53.5	11.4	38	83	1.75	.14	0.08
	Normative	76	50.4	10.1	--	--			
BMI	District	72	51.6	9.3	41	78	0.96	.08	0.34
	Normative	76	50.0	10.9	--	--			
MI	District	72	52.9	10.8	37	81	1.66	.13	0.10
	Normative	76	50.0	10.5	--	--			
GEC	District	72	52.6	10.1	38	73	1.61	.13	0.11
	Normative	76	50.0	9.5	--	--			

Note. *df* = 146

Eleven independent sample t-tests for males ages 9-13 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). The sample size of 164 out of a population of 288 yields a 5% error rate at the 95% confidence level. For this set of analyses, .004 alpha level was used. The results are presented in Table 11 where there were no significant findings on any of the scale/index subscales.

Table 11

Eleven t-tests for Scale/Index Subscales by Sample for 326 Males Ages 9-13

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max	*t*	*r*	*p*
Inhibit	District	164	51.4	10.6	42	99	0.94	.05	0.35
	Normative	162	50.3	10.6	--	--			
Shift	District	164	48.6	8.8	42	93	1.04	.06	0.30
	Normative	162	49.6	8.6	--	--			
Emotional Control	District	164	50.1	9.5	43	103	0.19	.01	0.85
	Normative	162	50.3	9.5	--	--			
Initiate	District	164	50.3	11.3	39	96	0.24	.01	0.81
	Normative	162	50.0	11.5	--	--			
Working Memory	District	164	51.1	12.3	38	108	0.91	.05	0.37
	Normative	162	49.9	11.6	--	--			
Planning	District	164	50.2	10.4	38	95	0.18	.01	0.86
	Normative	162	50.0	10.1	--	--			
Organization/ materials	District	164	51.0	11.7	42	90	0.54	.03	0.59
	Normative	162	50.3	11.7	--	--			
Monitor	District	164	49.9	9.9	38	96	0.28	.02	0.78
	Normative	162	49.6	9.6	--	--			
BMI	District	164	49.8	10.0	41	104	0.00	<.001	1.00
	Normative	162	49.8	9.9	--	--			
MI	District	164	50.5	11.3	37	102	0.40	.02	0.69
	Normative	162	50.0	11.2	--	--			
GEC	District	164	50.3	10.8	38	110	0.26	.01	0.80
	Normative	162	50.0	10.3	--	--			

Note. *df* = 324.

Eleven independent sample t-tests for males ages 14-18 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). The sample size of 178 out of a population of 257 yielded an error rate of 4.1% with a 95% confidence level. Alpha of .004 was used to evaluate these analyses. The results are presented in Table 12 and revealed that Normative had a smaller mean on Monitor ($p < .001$) compared to District. Therefore, the null hypothesis is rejected for the scale Monitor. No significant differences were revealed on other scale/index subscales. The incidence of teacher perception of clinically significant executive function in the school District sample does differ from that of the Normative sample for males ages 14-18 on Monitor with an effect size of .45. This is considered a small effect size (Cohen, 1988). Fourteen to eighteen year old males are perceived by their teachers to exhibit significantly more Monitor executive functioning difficulties than the Normative sample. The population of males 14-18 is not significantly different in teacher perception of executive function in Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, BRI, MI and GEC. The results are presented in Table 12.

Table 12

Eleven t-tests for Scale/Index Subscales by Sample for 225 Males Ages 14-18

Scale/Index	Group	n	Mean	S.D.	Range		*t*	*r*	*p*
					Min	Max			
Inhibit	District	178	52.1	12.1	44	99	1.13	.09	0.26
	Normative	47	49.8	13.7	--	--			
Shift	District	178	50.1	11	42	131	0.15	.01	0.87
	Normative	47	50.4	14.5	--	--			
Emotional Control	District	178	49.7	10.4	45	107	0.22	.02	0.82
	Normative	47	50.1	12.7	--	--			
Initiate	District	178	54.9	13.7	42	101	2.19	.17	0.03
	Normative	47	49.9	14.7	--	--			
Working Memory	District	178	53.5	14.5	43	111	1.55	.12	0.12
	Normative	47	49.7	16.7	--	--			
Planning	District	178	52.9	12.8	38	101	1.53	.12	0.13
	Normative	47	49.6	14.4	--	--			
Organization/ materials	District	178	48.9	11.7	44	136	0.62	.05	0.54
	Normative	47	50.2	16.3	--	--			
Monitor	District	178	52.3	12.1	41	99	6.38	.45	<.001
	Normative	47	65.4	14	--	--			
BMI	District	178	51.1	11.2	43	116	0.36	.03	0.72
	Normative	47	50.4	13.6	--	--			
MI	District	178	53.2	13.5	42	115	1.35	.10	0.18
	Normative	47	50.1	16	--	--			
GEC	District	178	52.6	13.4	42	113	1.16	.09	0.25
	Normative	47	50	14.6	--	--			

Note. *df* = 223.

Eleven independent sample t-tests for females ages 5-6 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). The sample of 32 out of a population of 94 yielded an error rate of 14.1 with a 95% confidence level. An alpha level of .004 was used (.05 level divided by 11 tests). In these analyses there were no statistically significant differences on the scales by group (Normative vs. District). None of the scales/index subscales were significant and the null hypothesis is retained. There is no difference between the Normative sample and the District sample with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC. Results are presented in Table 13.

Table 13

Eleven t-tests for Scale/Index Subscales by Sample for 61 Females Ages 5-6

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max.	*t*	*r*	p
Inhibit	District	32	54.3	13.3	44	93	1.34	.17	0.19
	Normative	29	49.9	12.3	--	--			
Shift	District	32	50.9	9.1	43	74	0.53	.07	0.60
	Normative	29	49.6	10	--	--			
Emotional Control	District	32	52.6	11	44	92	0.71	.09	0.48
	Normative	29	50.2	15.3	--	--			
Initiate	District	32	50.7	10.3	41	80	0.30	.04	0.77
	Normative	29	49.9	10.6	--	--			
Working Memory	District	32	51.4	11.2	42	86	0.38	.05	0.71
	Normative	29	50.3	11.7	--	--			
Planning	District	32	52.3	9.5	42	72	0.85	.11	0.40
	Normative	29	50.1	10.8	--	--			
Organization/materials	District	32	54.3	10.2	44	85	1.59	.19	0.12
	Normative	29	50	10.9	--	--			
Monitor	District	32	54.8	10.3	41	76	1.68	.21	0.10
	Normative	29	50.3	10.6	--	--			
BMI	District	32	53.3	10.9	42	90	1.05	.13	0.30
	Normative	29	50.1	12.9	--	--			
MI	District	32	53	10.1	42	77	1.13	.14	0.26
	Normative	29	50	10.7	--	--			
GEC	District	32	53.3	10	41	79	1.25	.16	0.22
	Normative	29	50	10.6	--	--			

Note. *df* = 59.

Eleven independent sample t-tests for females ages 7-8 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor BRI, MI and GEC by sample (Normative vs. District). The sample size of 68 out of a population of 104 yielded an error rate of 7% with a 95% confidence level. The results are presented in Table 14. An alpha level of .004 was used (.05 level divided by 11 tests). In these analyses there were no statistically significant differences on any the scales/indexes by group (Normative vs. District).

Table 14

Eleven t-tests for Scale/Index Subscales by Sample for 152 Females Ages 7-8

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max.	*t*	*r*	p
Inhibit	District	68	52.0	10.4	44	86	1.40	.11	0.16
	Normative	84	49.8	9.0	--	--			
Shift	District	68	50.5	9.6	43	89	0.15	.01	0.88
	Normative	84	50.3	7.3	--	--			
Emotional Control	District	68	53.4	13.7	44	97	1.95	.15	0.05
	Normative	84	50.0	7.4	--	--			
Initiate	District	68	50.4	8.4	41	82	0.43	.04	0.67
	Normative	84	49.8	8.7	--	--			
Working Memory	District	68	49.6	9.2	42	81	0.51	.04	0.61
	Normative	84	50.3	7.8	--	--			
Planning	District	68	50.1	8.4	42	78	0.00	<.001	1.00
	Normative	84	50.1	7.6	--	--			
Organization/materials	District	68	51.1	9.1	44	89	0.59	.05	0.55
	Normative	84	50.3	7.5	--	--			
Monitor	District	68	52.2	10.1	41	83	1.25	.10	0.21
	Normative	84	50.2	9.5	--	--			
BMI	District	68	52.5	11.7	42	89	1.57	.12	0.12
	Normative	84	50.0	7.8	--	--			
MI	District	68	50.8	8.7	42	77	0.60	.05	0.55
	Normative	84	50.0	7.7	--	--			
GEC	District	68	51.3	9.5	41	76	0.91	.07	0.36
	Normative	84	50.0	8.1	--	--			

Note. *df* = 150.

Eleven independent sample t-tests for females ages 9-13 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). The sample size of 166 out of a population of 277 yielded a 4.8% error rate with a 95% confidence level. The results are presented in Table 15. An alpha level of .004 was used (.05 level divided by 11 tests). In these analyses there were no statistically significant differences on any the scales/indexes by group (Normative vs. District).

Table 15

Eleven t-tests for Scale/Index Subscales by Sample for 390 Females Ages 9-13

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max.	t	*r*	p
Inhibit	District	166	52.9	15.7	44	124	1.89	.09	0.06
	Normative	224	49.7	17.1	--	--			
Shift	District	166	50.7	13.2	43	125	0.49	.03	0.62
	Normative	224	50.0	14.4	--	--			
Emotional Control	District	166	51.5	12.5	43	113	0.75	.04	0.46
	Normative	224	50.5	13.5	--	--			
Initiate	District	166	50.6	10.7	42	96	0.68	.04	0.50
	Normative	224	49.8	12.1	--	--			
Working Memory	District	166	51.2	12.1	42	113	0.85	<.001	0.40
	Normative	224	50.1	13.0	--	--			
Planning	District	166	49.9	11.7	42	104	0.08	.01	0.83
	Normative	224	50.0	12.0	--	--			
Organization/materials	District	166	52.8	15.6	44	129	1.48	.10	0.14
	Normative	224	50.4	16.0	--	--			
Monitor	District	166	50.3	11.9	41	112	0.08	<.001	0.81
	Normative	224	50.2	13.1	--	--			
BMI	District	166	52.0	14.1	43	130	1.22	.06	0.22
	Normative	224	50.1	16.0	--	--			
MI	District	166	50.8	12.7	42	118	0.52	.02	0.61
	Normative	224	50.1	13.6	--	--			
GEC	District	166	51.4	13.3	41	108	1.02	.05	0.31
	Normative	224	50.0	13.5	--	--			

Note. *df* = 388.

Eleven independent sample t-tests for females ages 14-18 were conducted to assess if differences exist with respect to Inhibit, Shift, Emotional Control, Initiate, Working Memory, Planning, Organization of Materials, Monitor, BRI, MI and GEC by sample (Normative vs. District). The sample size of 164 out of a population of 203 yielded a 3.4% error rate with a 95% confidence level. The results are presented in Table 15 and reveal that on Normative, Organization of Materials had a larger mean compared to District with an effect size of .24. This is a small effect size (Cohen, 1988). There were no significant findings on any of the other scale/index subscales. The null hypothesis is rejected for Organization of Materials. The District sample demonstrates a lower teacher perception of Organization of Materials difficulty than the Normative sample.

Table 16

Eleven t-tests for Scale/Index Subscales by Sample for 230 Females Ages 14-18

Scale/Index	Group	n	Mean	S.D.	Range Min.	Range Max.	*t*	*r*	p
Inhibit	District	164	49.4	10.4	45	112	0.56	.04	0.58
	Normative	66	50.2	8.0	--	--			
Shift	District	164	48.9	11.6	45	142	0.42	.03	0.67
	Normative	66	49.6	10.6	--	--			
Emotional Control	District	164	50.3	10.7	45	123	0.13	.01	0.88
	Normative	66	50.1	9.9	--	--			
Initiate	District	164	49.3	9.6	43	97	0.58	.04	0.57
	Normative	66	50.1	9.4	--	--			
Working Memory	District	164	50.3	10.0	43	107	0.35	.03	0.73
	Normative	66	49.8	9.3	--	--			
Planning	District	164	48.6	10.4	43	107	1.19	.09	0.24
	Normative	66	50.4	10.3	--	--			
Organization/materials	District	164	47.1	5.9	44	105	3.45	.24	<.001
	Normative	66	50.1	6.1	--	--			
Monitor	District	164	49.5	9.7	42	105	0.29	.02	0.77
	Normative	66	49.9	8.6	--	--			
BMI	District	164	49.9	10.9	45	129	0.07	<.001	0.81
	Normative	66	49.8	9.1	--	--			
MI	District	164	49.1	9.5	42	108	0.66	.05	0.51
	Normative	66	50.0	9.1	--	--			
GEC	District	164	49.2	10.2	42	121	0.55	.04	0.58
	Normative	66	50.0	9.2	--	--			

Note. *df* = 228.

Summary Question 1

To summarize the analysis of research question 1, the School District's general education population is compared to the Normative sample. Five to six year old District males and females are comparable to the Normative sample. Seven to eight year old males demonstrate a higher level of teacher perception of difficulty in Organization of

Materials. Seven to eight year old girls demonstrate no difficulties compared to the Normative sample. Males and females ages 9-13 are comparable to the Normative sample. Males ages 14-18 demonstrate a higher level of Monitor difficulty than the Normative sample as perceived by the teachers. Females ages 14-18 were comparable to the Normative sample on all areas with the exception of Organization of Materials, where the teachers perceive lower levels of clinically significant scores.

Research Question 2

Question 2 examines differences within the school district with respect to the incidence of clinically significant T-scores by Sex, Educational Classification and Developmental Status. BRIEF T-Score data were converted to clinically significant- 65 and greater, and not clinically significant- <65. Percentages of clinically significant scores were compared along Sex, Educational Classification and Developmental Status lines using CrossTab percentages.

Question 2A. Question 2A examines the incidence of clinically significant T-scores by Sex. On the Inhibit scale, 17.8% of males and 14.2 % of females had clinically significant scores. On Shift, 13.3% of males and 11.6% of females had clinically significant scores. On Emotional Control, 12.6% of males and 13.1% of females demonstrated clinically significant scores. On the Initiate scale, 22% of males and 14.1% of females demonstrated clinically significant scores. On the Working Memory scale, 23.4% of males and 13.9% of females had clinically significant scores. On the Planning scale, 29% of males and 13.1% of females had clinically significant scores. On the Organization of Materials scale, 17.1% of males and 9.3% of females demonstrated clinically significant scores. On the Monitor scale, 19.5% of males and 12.7% of females demonstrated clinically significant scores. On the BRI, 13.8% of males demonstrated clinically significant scores and 12.2% of females demonstrated clinically significant scores. On MI, 24.1% of males demonstrated clinically significant scores and 13.5% of females demonstrated clinically significant scores. On the GEC, 20.1% of males and 14% of females demonstrate clinically significant scores. Table 17 delineates the numbers and percentages of clinically significant scores by sex.

Table 17

Incidence of Clinically Significant BRIEF Scores by Sex

Sex	CS N	CS %	Not CS N	Not CS %	Total N	Total Pop%	%CS
			Inhibit				
Male	105	58.3	485	51.8	590	52.9	17.8
Female	75	41.7	451	48.2	526	41.7	14.2
Total	180		936		1116		16.1
			Shift				
Male	79	56.4	511	52.4	590	52.9	13.3
Female	61	43.6	465	47.6	526	47.1	11.6
Total	140		976		1116		12.5
			Emotional Control				
Male	74	51.7	515	53.0	589	52.8	12.6
Female	69	48.3	457	47	526	47.2	13.1
Total	143		972		1115		12.8
			Initiate				
Male	130	63.7	459	50.5	589	52.9	22
Female	74	36.3	450	49.5	524	47.1	14.1
Total	204		909		1113		18.3
			Working Memory				
Male	138	65.4	452	49.9	590	52.9	23.4
Female	73	34.6	453	50.1	526	47.1	13.9
Total	211		905		1116		19.0
			Planning				
Male	131	65.5	459	50.1	590	52.9	29.0
Female	69	34.5	457	49.9	526	47.1	13.1
Total	200		916		1116		18.0
			Organization of Materials				
Male	101	67.3	489	50.7	590	52.9	17.1
Female	49	32.7	476	49.3	525	47.1	9.3
Total	150		965		1115		13.5
			Monitor				
Male	115	63.2	475	50.9	590	52.9	19.5
Female	67	36.8	459	49.1	526	47.1	12.7
Total	182		934		1116		16.3

Table 17 continued

	BRIEF SCALES						
Sex	CS		Not CS		Total		
	N	%	N	%	N	Pop%	%CS
			BRI				
Male	81	55.9	507	52.4	588	52.8	13.8
Female	64	44.1	461	47.6	525	47.2	12.2
Total	145		968		1113		13.0
			MI				
Male	142	66.7	448	49.6	590	52.9	24.1
Female	71	33.3	455	50.4	526	47.1	13.5
Total	213		903		1116		19.1
			GEC				
Male	117	61.6	464	50.7	581	52.6	20.1
Female	73	38.4	451	49.3	524	47.4	14.0
Total	190		915		1105		17.2

Figure 4 shows the graphic representation of the incidence of clinically significant scores by sex. Males demonstrate a higher incidence of clinically significant scores than females in all areas except emotional control. There is a slight difference between males and females in emotional control, with females demonstrating slightly higher scores. Differences range from a 1.7% difference on the Shift scale to a difference of nearly 16% on the Planning scale. Results suggest that there is a practical difference between males and females, with males generally demonstrating a higher incidence of clinically significant scores than females. However, as seen in Table 18, the difference between the male and female groups is not clinically significant.

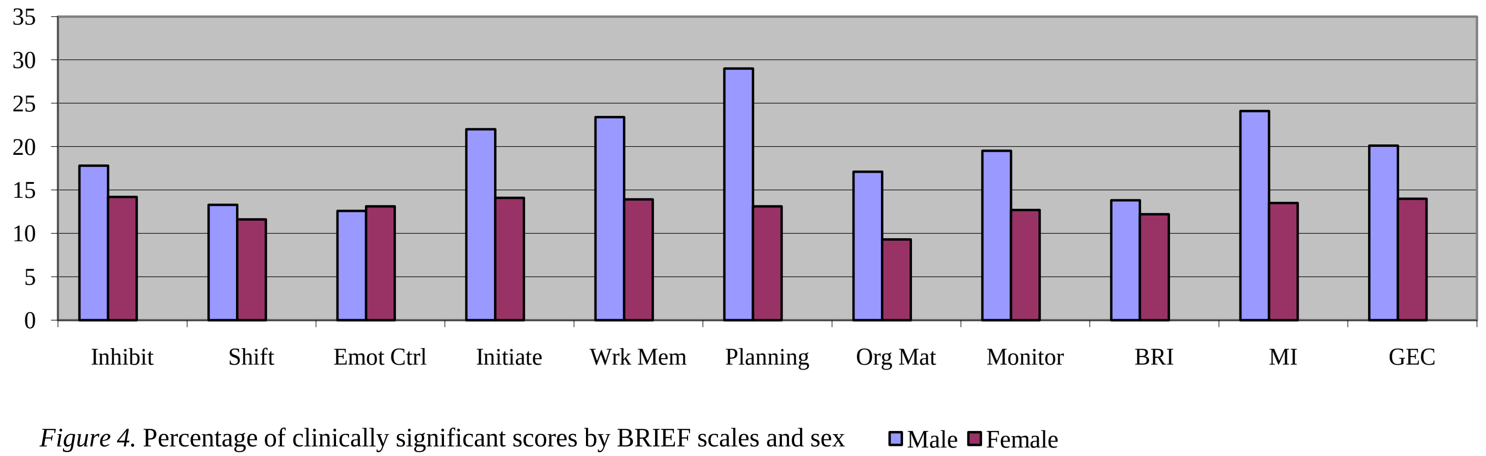

Figure 4. Percentage of clinically significant scores by BRIEF scales and sex

Table 18

Multivariate Analysis of Variance (1-way) of BRIEF scales by SEX.

DESCRIPTIVE STATISTICS -

	Inhibit				Shift				Emotional Control			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
Male	577	.18	.38	0-1	577	.12	.38	0-1	577	.12	.32	0-1
Female	520	.14	.35	0-1	520	.11	.35	0-1	520	.13	.34	0-1
Total	1097	.16	.36	0-1	1097	.12	.36	0-1	1097	.12	.33	0-1

	Initiate				Working Memory				Monitor			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
Male	577	.21	.41	0-1	577	.23	.42	0-1	577	.19	.39	0-1
Female	520	.14	.35	0-1	520	.14	.34	0-1	520	.13	.33	0-1
Total	1097	.18	.38	0-1	1097	.18	.39	0-1	1097	.16	.36	0-1

	Planning				Org. of Materials				BRI			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
Male	577	.21	.41	0-1	577	.16	.37	0-1	577	.13	.34	0-1
Female	520	.13	.34	0-1	520	.09	.29	0-1	520	.12	.32	0-1
Total	1097	.38	.38	0-1	1097	.13	.33	0-1	1097	.12	.33	0-1

	MI				GEC			
Group	n	Mean	SD	Range	n	Mean	SD	Range
Male	577	.23	.42	0-1	577	.20	.40	0-1
Female	520	.13	.34	0-1	520	.14	.35	0-1
Total	1097	.19	.39	0-1	1097	.17	.38	0-1

ANALYSIS OF VARIANCE -

Test Name	Value	Approx F	Hyp. df.	Error df.	p.
Pillai's Trace	.024	2.42	11	1085	.006
Wilks' Lambda	.976	2.42	11	1085	.006
Hotelling's Trace	.025	2.42	11	1085	.006
Roy's Largest Root	.025	2.42	11	1085	.006

A one-way between-groups Multivariate Analysis of Variance was performed to investigate sex differences on the BRIEF incidences of significance. Eleven dependent variables were used: Behavioral Regulation Index (BRI), Metacognition Index (MI), Global Executive Composite (GEC), and then 8 individual clinical scales (inhibit, initiate, working memory, planning, organization of materials, monitor and shift). The independent variable was gender. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity. Although the assumption of homogeneity of variance-covariance matrices was violated, no corrections were needed because the number of individuals in each group exceeded 30. The variance matrices were not statistically significant. There was not a statistically significant difference between males and females on the combined dependent variables, F (11,1085) = 2.42, p <.0005, Wilks' Lambda .006; partial eta squared = .024. There is no difference between the teacher's perception of males' and females' executive function.

Question 2B. Question 2B examines the incidence of clinically significant T-scores by Educational Classification-General, Special and Gifted. General education students were the largest group of students. On the Inhibit scale, 123 of 789 (13.5%) students had clinically significant scores. On Shift, 81 of 912 (8.9%) demonstrated clinically significant scores. On the Emotional Control scale, 89 of 911 (9.8%) demonstrated clinically significant scores. On the Initiate scale, 134 of 909 (14.7%) students had scores in the clinically significant range. In Working Memory, 127 of 912 (13.9%) students had clinically significant scores. On the Planning scale, 124 of 912 (13.6%) demonstrated clinically significant scores. For Organization of Materials, 98 of 912(10.7) had clinically significant scores. On the Monitor scale, 118 out of 912 (12.9%) of general education students had clinically significant scores. On the Behavioral Regulation Index, 90 of 910 (9.9%) students had clinically significant scores. On the Metacognition Index, 136 of 912 (14.9%) of students had clinically significant scores.

On the Global Executive Composite, 111 of 902 (12.3%) general education students demonstrated clinically significant scores.

The students identified as Special education demonstrated much higher percentages of clinically significant scores than general education students. On the Inhibit scale, 52 of 157 (33.1%) students had clinically significant scores. On Shift, 54 of 157 (34.4%) demonstrated clinically significant scores. On the Emotional Control scale, 51 of 157 (32.5%) demonstrated clinically significant scores. On the Initiate scale, 67 of 157 (42.7%) students had scores in the clinically significant range. In Working Memory, 79 of 157 (50.3%) students had clinically significant scores. On the Planning scale, 69 of 157 (43.9%) demonstrated clinically significant scores. For Organization of Materials, 46 of 156 (29.5%) had clinically significant scores. On the Monitor scale, 58 out of 157 (36.9%) of general education students had clinically significant scores. On the Behavioral Regulation Index, 50 of 156 (32.1%) students had clinically significant scores. On the Metacognition Index, 71 of 157 (45.2%) of students had clinically significant scores. On the Global Executive Composite, 72 of 156 (46.2%) general education students demonstrated clinically significant scores.

There were 44 students who were identified as Gifted. Few of these students demonstrated clinically significant scores. Three students (6.8%) demonstrated clinically significant scores on the following scales: Inhibit, Shift, Working Memory, Monitor, BRI and MI. Four students (9.1%) demonstrated clinically significant scores on Organization of Materials and GEC. Five students ((11.4%) demonstrated clinically significant scores on Planning. Two students (4.5%) had clinically significant scores on Emotional Control and one student (2.3%) had a clinically significant score on Initiate. Table 19 shows the numbers of students who were clinically significant and not clinically significant as well as percentages and total population figures. Figure 5 is a graphic depiction of the percentages of clinically significant scores within the Educational Classification variable.

Table 19

Incidence of Clinically Significant BRIEF Scores by Educational Classification

	BRIEF SCALES						
Age Group	CS		Not CS		Total		
	N	%	N	%	N	Pop%	%CS
			Inhibit				
General	123	69.1	789	84.4	912	81.9	13.5
Special	52	29.2	105	11.2	157	14.1	33.1
Gifted	3	1.7	41	4.4	44	4.0	6.8
Total	178		935		1113		16.0
			Shift				
General	81	58.7	831	85.2	912	81.9	8.9
Special	54	39.1	103	10.6	157	14.1	34.4
Gifted	3	2.2	41	4.2	44	4.0	6.8
Total	138		975		1113		12.4
			Emotional Control				
General	89	62.7	822	84.7	911	81.9	9.8
Special	51	35.9	106	10.9	157	14.1	32.5
Gifted	2	1.4	42	4.3	44	4.0	4.5
Total	142		970		1112		12.8
			Initiate				
General	134	66.3	775	85.4	909	81.9	14.7
Special	67	33.2	90	9.9	157	14.1	42.7
Gifted	1	.5	43	4.7	44	4.0	2.3
Total	202		908		1110		18.2
			Working Memory				
General	127	60.8	785	86.6	912	81.9	13.9
Special	79	37.8	78	8.6	157	14.1	50.3
Gifted	3	1.4	41	4.5	44	4.0	6.8
Total	209		904		1113		18.8
			Planning				
General	124	62.6	788	86.1	912	81.9	13.6
Special	69	34.8	88	9.6	157	14.1	43.9
Gifted	5	2.5	39	4.3	44	4.0	11.4
Total	198		915		1113		17.8

Table 19 continued

	BRIEF SCALES						
Age Group	CS		Not CS		Total		
	N	%	N	%	N	Pop%	%CS
			Organization of Materials				
General	98	66.2	814	84.4	912	82.0	10.7
Special	46	31.1	110	11.4	156	14.0	29.5
Gifted	4	2.7	40	4.1	44	4.0	9.1
Total	148		964		1112		13.3
			Monitor				
General	118	65.9	794	85.0	912	81.9	12.9
Special	58	32.4	99	10.6	157	14.1	36.9
Gifted	3	1.7	41	4.4	44	4.0	6.8
Total	179		934		1113		16.1
			BRI				
General	90	62.9	820	84.8	910	82.0	9.9
Special	50	35.0	106	11.0	156	14.1	32.1
Gifted	3	2.1	41	4.2	44	4.0	6.8
Total	143		967		1110		12.9
			MI				
General	136	64.8	776	85.9	912	81.9	14.9
Special	71	33.8	86	9.5	157	14.1	45.2
Gifted	3	1.4	41	4.5	55	4.0	6.8
Total	210		903		1113		18.9
			GEC				
General	111	59.4	791	86.44	902	81.9	12.3
Special	72	38.5	84	9.2	156	14.2	46.2
Gifted	4	2.1	40	4.4	44	4.0	9.1
Total	187		915		1102		17.0

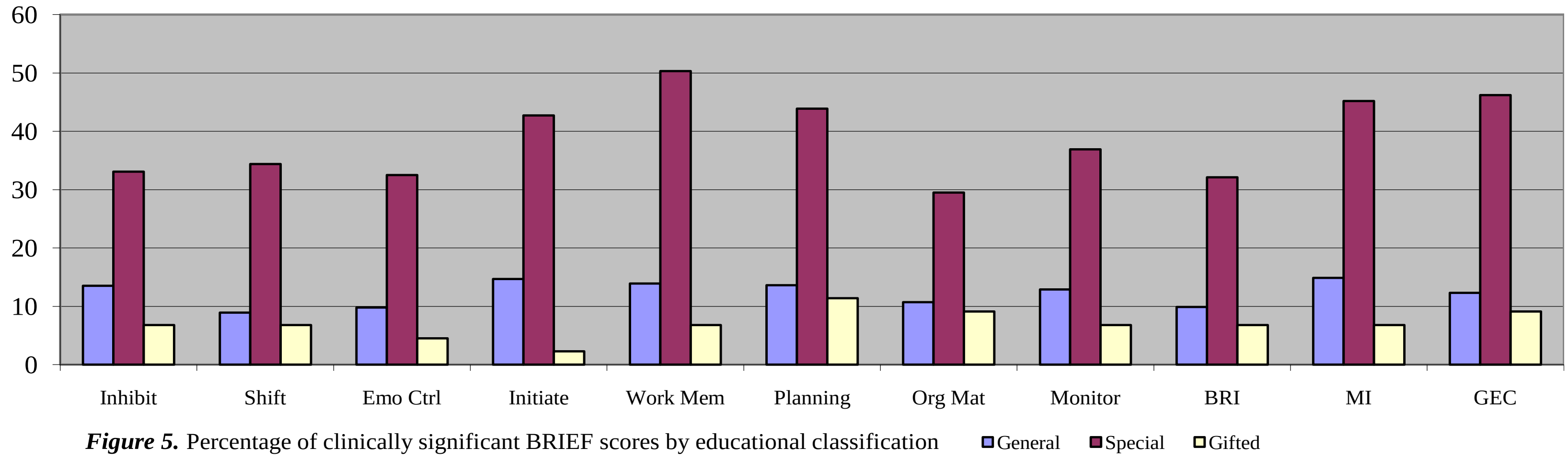

Figure 5. Percentage of clinically significant BRIEF scores by educational classification

Table 20

Multivariate Analysis of Variance (1-way) of BRIEF scales by Educational Classification

DESCRIPTIVE STATISTICS -

	Inhibit				Shift				Emotional Control			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
General	896	.13	.34	0-1	896	.83	.28	0-1	896	.95	.29	0-1
Special	154	.32	.47	0-1	154	.33	.47	0-1	154	.31	.47	0-1
Gifted	44	.07	.26	0-1	44	.07	.26	0-1	44	.45	.21	0-1
Total	1094	.16	.36	0-1	1094	.12	.32	0-1	1094	.12	.33	0-1

	Initiate				Working Memory				Monitor			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
General	896	.14	.35	0-1	896	.13	.34	0-1	896	.12	.33	0-1
Special	154	.42	.49	0-1	154	.49	.50	0-1	154	.36	.48	0-1
Gifted	44	.02	.15	0-1	44	.07	.26	0-1	44	.07	.26	0-1
Total	1094	.18	.38	0-1	1094	.18	.39	0-1	1094	.16	.36	0-1

	Planning				Org of Materials				BRI			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
General	896	.13	.34	0-1	896	.10	.30	0-1	896	.09	.29	0-1
Special	154	.43	.50	0-1	154	.29	.45	0-1	154	.31	.47	0-1
Gifted	44	.11	.32	0-1	44	.09	.29	0-1	44	.07	.26	0-1
Total	1094	.17	.38	0-1	1094	.13	.33	0-1	1094	.12	.33	0-1

	MI				GEC			
Group	n	Mean	SD	Range	n	Mean	SD	Range
General	896	.14	.35	0-1	896	.12	.33	0-1
Special	154	.44	.50	0-1	154	.45	.50	0-1
Gifted	44	.07	.26	0-1	44	.09	.29	0-1
Total	1094	.18	.38	0-1	1094	.17	.37	0-1

MULTIVARIATE ANALYSIS OF VARIANCE -

Test Name	Value	Approx F	Hyp. df.	Error df.	p.
Pillai's Trace	.052	8.08	22	2164	<.001
Wilks' Lambda	.849	8.35	22	2162	<.001
Hotelling's Trace	.176	8.63	22	2160	<.001
Roy’s Largest Root	.167	16.45	11	1082	<.001

Table 20 Continued

Source of Variation	Mean df	Square	F	$\eta 2$	p
Inhibit	2	5195.3	32.1	.056	<.001
Shift	2	8075.0	52.6	.088	<.001
Emotional Control	2	5373.5	37.0	.063	<.001
Initiate	2	7584.5	55.1	.093	<.001
Working Memory	2	12854.3	79.8	.128	<.001
Planning	2	8350.4	62.0	.102	<.001
Organization of Materials	2	4334.7	26.6	.045	<.001
Monitor	2	6529.5	49.1	.083	<.001
BRI	2	7054.9	45.8	.077	<.001
MI	2	10040.4	51.7	.110	<.001
GEC	2	10502.2	68.8	.112	<.001
Residual	1091				

ANALYSIS OF VARIANCE (one way)

Source of Variation	Mean df	Square	F	$\eta 2$	p
Inhibit	2	2.775	21.39	.037	<.001
Residual	1110	.130			
Shift	2	4.431	43.90	.073	<.001
Residual	1110	.101			
Emotional Control	2	3.610	34.32	.058	<.001
Residual	1109	.105			
Initiate	2	5.804	41.82	.070	<.001
Residual	1107	.139			
Working Memory	2	3.610	34.32	.058	<.001
Residual	1109	.105			
Planning	2	6.264	46.28	.077	<.001
Residual	1110	.135			
Organization of Materials	2	2.380	21.37	.037	<.001
Residual	1109	.111			
Monitor	2	4.055	31.68	.054	<.001
Residual	1110	.128			
BRI	2	3.354	31.50	.054	<.001
Residual	1107	.106			
MI	2	6.485	45.73	.076	<.001
Residual	1110	.142			
GEC	2	7.761	61.03	.100	<.001
Residual	1099	.127			

A one-way between-groups Multivariate Analysis of Variance was performed to investigate Educational Classification differences on the BRIEF. Eleven dependent variables were used: Behavioral Regulation Index (BRI), Metacognition Index (MI), Global Executive Composite (GEC), and then 8 individual clinical scales (inhibit, initiate, working memory, planning, organization of materials, monitor and shift). The independent variable was educational classification. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity. Although the assumption of homogeneity of variance-covariance matrices was violated, no corrections were needed. The variance matrices were statistically significant because of the large sample size. All variables violated the assumption of homogeneity of error variance, therefore a more conservative alpha level (.01) will be used. There was a statistically significant difference between general, special and gifted educational categories on the combined dependent variables, F (11, 1,110) = 10.140, p <.0005, Wilks' Lambda <.0005; partial eta squared = .094. When the results for the dependent variables were considered separately, differences to reach statistical significance, using a Bonferroni adjusted alpha level of .0009, were found on all 11 dependent variables: inhibit, F(2,1110) = 2.5, p.<0005 , partial eta squared=.035; shift, F(2,1110) = 4.1 p <.0005, partial eta squared = .072; emotional control, F(2,1109) = 3.2, p<.0005, partial eta squared = .054; initiate, F(2,1107) = 5.4, p<.0005, partial eta squared = .068; working memory, F(2,1109) = 8.8, p<.0005, partial eta squared = .108; planning, F(2, 1110) = 5.9, p<.0005, partial eta squared = .078; organization of materials, F(2,1109) = 26.6, p<.0005, partial eta squared = .038; monitor, F(2, 1110) = 49.1, p<.0005, partial eta squared = .052; BRI, F(2, 1107) = 45.8, p<.0005, partial eta squared = .054; MI, F(2, 1110) = 67.7, p<.0005, partial eta squared = .075; GEC, F(2,1099) = 68.8, p<.0005, partial eta squared = .096. These are considered to be small effect sizes (Cohen, 1988).

Eleven individual ANOVAs were conducted to determine the differences between educational classifications and significant variables. The special education classification students demonstrated significantly higher incidences than general or gifted education students on all 11 BRIEF variables. Special education students were perceived by their teachers to have higher incidences of clinically significant scores than general or gifted education students on each BRIEF scale. There were no significant differences between general and gifted education students on any variables.

Actual differences of special education incidences versus general and gifted education students were then examined. For the variable Inhibit, the difference in incidence between special education and general education students is .20, or 20%, and gifted and special education is .26, or 26%. For the variable Shift, the difference in incidence between special education and general education students is .255 or 25.5% and for gifted is .276 or 27.6%. For the variable Emotional Control, the difference in incidence between special education and general education students is .227 or 22.7% and for gifted is .279 or 27.9%. For the variable Initiate, the difference in incidence between special education and general education students is .279 or 27.9% and for gifted is .404 or 40.4%. For the variable Working Memory, the difference in incidence between special education and general education students is .227 or 22.7% and for gifted is .279 or 27.9%. For the variable Planning, the difference in incidence between special education and general education students is .304 or 30.4% and for gifted is .326 or 32.6%. For the variable Organization of Materials, the difference in incidence between special education and general education students is .187 or 18.7% and for gifted is .204 or 20.4%. For the variable Monitor, the difference in incidence between special education and general education students is .24 or 24% and for gifted is .301 or 30.1%. For the variable BRI, the difference in incidence between special education and general education students is .222 or 22.2% and for gifted is .252 or 25.2%. For the variable MI, the difference in incidence between special education and general education students is .303 or 30.3% and for gifted is .384 or 38.4%. For the variable GEC, the difference in incidence between special education and general education students is .339 or 33.9% and for gifted is .371 or 37.1%.

The incidence of clinically significant scores was examined within the categories of Developmental Status, Educational Classification and Sex. Table 21 shows the full table of scores and percentages. There are no males or females ages 5-6 with clinically significant scores in the Gifted education classification. There is one male and no females age 5-6 with clinically significant scores in the Special education classification. Only the General Education group has enough students to have meaningful analysis. On the Inhibit scale, three males age 5-6 (10.3%) of a population of 29 have clinically significant scores. Seven females of a population of 32 (21.9%) have clinically significant scores. On the Shift scale, one male age 5-6 (3.4%) has a clinically significant score of a population of 29. Two females of a population of 32 (6.3%) have clinically significant scores. On the Emotional Control scale, 1 male in a population of 28 (3.4%) has a clinically significant score while 3 females of a population of 32(9.4%) have clinically significant scores. On the Initiate scale, six males of a population of 29 (20.7%) have clinically significant scores. Four females out of a population of 32(12.5%) have clinically significant scores on Initiate. In Working Memory, 7 males of a population of 29 (24.1%) and four females of a population of 32 (12.5%) have clinically significant scores. In Planning, 5 males (17.2%) and 5 females (15.6%) have clinically significant scores. On the Organization of Materials scale, 5 males (17.2%) and 6 females (18.8%) have clinically significant scores. On the Monitor Scale, 7 males ages 5-6 (24.1%), and six females (18.8%) have clinically significant scores. On the Behavioral Regulation Index, one male (3.4%) and 5 females (15.6%) have clinically significant scores. On the Metacognition Index, 8 males (27.6%) and 5 females (15.6$) have clinically significant scores. On the Global Executive Composite, 4 males (13.8%) and 5 females (15.6%) have clinically significant scores.

Males and females ages 7-8 were examined by educational classification. There were not enough individuals in the categories of special education or gifted education to make meaningful analysis. Therefore, only the general education students will be examined. On the Inhibit scale, 15 males ages 7-8 of a population of 75 (20%) and 11 females ages 7-8 of a population of 68 (16.2%) had clinically significant scores. On the Shift scale, 9 of 88 males (12%) and 7 of 68 females (10.3%) had clinically significant scores. On the Emotional Control scale, 8 of 75 males (10.7%) and 12 of 68 females (17.6%) had clinically significant scores. On Initiate, 10 of 75 males (13.3%) and 6 of 68 females (8.8%) had clinically significant scores. On the Working Memory scale, 11 of 75 males (14.7%) and 5 of 68 females (7.4%) had clinically significant scores. On Planning, 14 of 75 males (18.7) and 6 of 68 females (8.8%) had clinically significant scores. On Organization of Materials, 12 of 75 males (16%) and 7 of 68 females (10.3%) had clinically significant scores. On Monitor, 15 males of a population of 75 (20%) and 8 of 68 females (11.8%) had clinically significant scores. On the Behavior Regulation Index, 11 of 74 males (14.9%) and 11 of 68 females (16.2%) had clinically significant scores. On the Metacognition Index, 16 of 75 males (21.3%) and 6 of 68 (8.8%) had clinically significant scores. On the Global Executive Composite, 11 of 73 males (15.1%) and 9 of 68 females (13.2%) had clinically significant scores.

Males and females ages 9-13 were examined by Educational Classification. This group had enough individuals in each classification area to analyze General, Special and Gifted classifications. For the Inhibit scale, there were 15 of 167 (9%) General education males with clinically significant scores, 18 of 46 (39.1%) Special education males and 1 of 6 (16.7%) Gifted males with clinically significant scores. For females ages 9-13 on the Inhibit scale, there were 27 of 170 (15.9%) General education, 12 of 28 (42.9%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Shift scale, for males age 9-13, there were 11 of 167 (6.7%) General education, 13 of 46 (28.3%) Special education, and 1 of 6 (16.7%) Gifted education students with clinically significant scores. For females ages 9-13 on the Shift scale, there were 19 of 170 (11.2%) General education, 7 of 28 (25%) Special education, and 0 of 9 (0%)Gifted education students with clinically significant scores. On the Emotional Control scale for males age 9-13, there were 13 of 167 (8.4%) General education, 14 of 46 (30.4%) Special Education and 1 of 6 (16.7%) Gifted education students with clinically significant scores. For females ages 9-13 on the Emotional Control scale, there were 21 of 170 (12.4%) General education, 9 of 28 (32.1%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Initiate scale for males age 9-13, there were 19 of 166 (11.4%) General education, 19 of 46 (41.3%) special education and 0 of 6 (0%) Gifted education students with clinically significant scores. For females ages 9-13 on the Initiate Scale there were 27 of 168 (16.1%) General education, 12 of 28 (42.9%)

Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Working Memory scale for males ages 9-13, there were 20 of 167 (12%) General education, 22 of 46 (47.8%) Special Education and 1 of 6 (16.7%) Gifted education students with clinically significant scores. For females, ages 9-13, on the Working Memory scale there were 22 of 170 (12.9%) General education, 16 of 28 (57.7%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Planning scale for males ages 9-13, there were 18 of 167 (10.8%) General education, 21 of 46 (45.7%) Special education and 0 of 1 Gifted education students with clinically significant scores. For females, ages 9-13, on the Planning scale, there were 20 of 170 (11.8%) General education, 11 of 28 (39.3%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Organization of Materials scale, males ages 9-13, there were 23 of 167 (13.8%) General education, 20 of 46 (43.5%) Special education and 2 of 6 (33.3%) Gifted education students with clinically significant scores. For females, ages 9-13, on the Organization of Materials scale, there were 23 of 170 (13.5%) General education, 6 of 28 (21.4%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Monitor scale for males, ages 9-13, there were 12 of 167 males (7.2%) General education, 15 of 46 (32.6%) Special education and 1 of 6 (16.7%) Gifted education students with clinically significant scores. For females, ages 9-13, on the Monitor scale, there were 18 of 170 (10.6%) General education, 13 of 28 (46.4%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Behavioral Regulation Index for males, ages 9-13, there were 13 of 167 (8.4%) General education, 14 of 46 (30.4%) Special education and 1 of 6 (16.7%) Gifted education students with clinically significant scores. For females, ages 9-13, on the Behavioral Regulation Index there were 16 of 169 (9.5%) General education, 9 of 28 (32.1%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Metacognition Index for males, ages 9-13, there were 17 of 167 (10.2%) General education, 21 of 46 (45.7%) Special education and 1 of 6 (16.7%) Gifted education students with clinically significant scores. For females, ages 9-13, on the Metacognition Index, there were 25 of 170 (14.7%) General education, 12 of 28 (42.9%) Special education and 0 of 9 (0%) Gifted education students with clinically significant scores. On the Global Executive Composite for males, ages 9-13, there were 15 of 165 (9.1%) General education, 23 of 46 (50%) Special education and 2 of 6 (33.6%) Gifted education students with clinically significant scores. For females ages 9-13 of the Global Executive Composite, there were 21 of 169 (12.4%) General education, 12 of 18 (42.9%) Special education, and 0 of 9 (0%) Gifted education students with clinically significant scores.

Males and females, ages 14-18, were examined by Educational Classification. This group had enough individuals in each classification area to analyze General, Special and Gifted classifications. For the Inhibit scale, there were 31 of 183 (16.9%) General education males with clinically significant scores, 15 of 45 (33.3%) Special education males and 2 of 12 (16.7%) Gifted males with clinically significant scores. For females ages 14-18 on the Inhibit scale, there were 11 of 165 (6.7%) General education, 8 of 24 (33.3%) Special education and 0 of 13 (0%) Gifted education students with clinically significant scores. On the Shift scale, for males age 14-18, there were 20 of 183 (10.9%) General education, 18 of 45 (40%) Special education, and 2 of 12 (20%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Shift scale, there were 10 of 165 (6.1%) General education, 13 of 24 (54.2%) Special education, and 0 of 13 Gifted education students with clinically significant scores. On the Emotional Control scale for males, ages 14-18, there were 19 of 182 (10.4%) General education, 14 of 45 (31.1%) Special Education and 1 of 12 (8.3%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Emotional Control scale, there were 11 of 165 (6.7%) General education, 11 of 24 (45.8%) Special education and 0 of 13 Gifted education students with clinically significant scores. On the Initiate scale for males, ages 14-18, there were 42 of 183 (23%) General education, 24 of 45 (53.3%) special education and 1 of 12 (8.3%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Initiate Scale there were 12 of 165 (16.1%) General education, 8 of 24 (33.3%) Special education and 0 of 13 Gifted education students with clinically significant scores. On the Working Memory scale for males, ages 14-18, there were 39 of 183 (21.3%) General education, 27 of 45 (60%) Special Education and 2 of 12 (16.7%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Working Memory scale there were 13 of 165 (7.9%) General education, 9 of 24 (37.5%) Special education and 0 of 13 (0%) Gifted education students with clinically significant scores. On the Planning scale for males, ages 14-18, there were 36 of 183 (19.7%) General education, 25 of 45 (55.6%) Special education and 3 of 12 (25%) Gifted education students with clinically significant scores. For females ages 14-18 on the Planning scale, there were 15 of 165 (9.1%) General education, 8 of 24 (33.3%) Special education and 0 of 13 (0%) Gifted education students with clinically significant scores. On the Organization of Materials scale, males ages 14-

18, there were 16 of 183 (8.7%) General education, 15 of 45 (33.3%) Special education and 2 of 12 (16.7%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Organization of Materials scale, there were 3 of 165 (1.8%) General education, 3 of 23 (13%) Special education and 0 of 13 Gifted education students with clinically significant scores. On the Monitor scale for males, ages 14-18, there were 36 of 183 males (19.7%) General education, 20 of 45 (44.4%) Special education and 2 of 12 (16.7%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Monitor scale, there were 10 of 165 (6.1%) General education, 5 of 24 (20.8%) Special education and 0 of 13 (0%) Gifted education students with clinically significant scores. On the Behavioral Regulation Index for males, ages 14-18, there were 22 of 183 (12%) General education, 14 of 45 (31%) Special education and 2 of 12 (16.7%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Behavioral Regulation Index there were 9 of 165 (5.5%) General education, 12 of 24 (50%) Special education and 0 of 13 (0%) Gifted education students with clinically significant scores. On the Metacognition Index for males, ages 14-18, there were 42 of 183 (23%) General education, 28 of 45 (62%) Special education and 2 of 12 (16.7%) Gifted education students with clinically significant scores. For females, ages 14-18, on the Metacognition Index, there were 11 of 165 (6.7%) General education, 8 of 24 (33.3%) Special education and 0 of 13 (0%) Gifted education students with clinically significant scores. On the Global Executive Composite for males, ages 14-18, there were 29 of 179 (16.2%) General education, 22 of 44 (50%) Special education and 2 of 12 (16.7%) Gifted education students with clinically significant scores. For females, ages 14-18, of the Global Executive Composite, there were 11 of 164 (6.7%) General education, 10 of 24 (41.7%) Special education, and 0 of 13 (0%) Gifted education students with clinically significant scores.

Table 21

Populations and Percentages of Clinically Significant and Non-Significant T-Scores of Eleven Dependent Variables by Sex, Age Group, and Educational Classification

			Inhibit					Shift				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Male	5-6	General	3	10.3	26	90.7	29	1	3.4	28	96.6	29
Male	5-6	Sp. Education	0	0	1	100	1	0	0	1	100	1
Male	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	3		27		30	1		29		30
Male	7-8	General	15	20	60	80	75	9	12	66	88	75
Male	7-8	Sp. Education	0	0	1	100	1	0	0	3	100	3
Male	7-8	Gifted	0	0	1	100	1	0	0	1	400	1
		Total	15		62		77	9		70		79
Male	9-13	General	15	9	152	91	167	11	6.7	156	93.3	167
Male	9-13	Sp. Education	18	39.1	28	60.9	46	13	28.3	33	71.7	46
Male	9-13	Gifted	1	16.7	5	83.3	6	1	16.7	5	83.3	6
		Total	34		185		219	25		194		213
Male	14-18	General	31	16.9	152	83.1	183	20	10.9	163	89.1	183
Male	14-18	Sp. Education	15	33.3	30	66.7	45	18	40	27	60	45
Male	14-18	Gifted	2	16.7	10	83.3	12	2	20	10	80	12
		Total	48		192		240	40		200		240

Table 21 continued

			Inhibit					Shift				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Female	5-6	General	7	21.9	25	78.1	32	2	6.3	30	93.8	32
Female	5-6	Sp. Education	0	-	0	-	0	0	-	0	-	0
Female	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	7		25		32	2		30		32
Female	7-8	General	11	16.2	57	83.8	68	7	10.3	61	89.7	68
Female	7-8	Sp. Education	0	0	5	100	5	2	40	3	60	5
Female	7-8	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	11		62		73	9		64		73
Female	9-13	General	27	15.9	143	84.1	170	19	11.2	151	88.8	170
Female	9-13	Sp. Education	12	42.9	16	57.1	28	7	25	21	75	28
Female	9-13	Gifted	0	0	9	100	9	0	0	9	100	9
		Total	39		168		207	26		181		208
Female	14-18	General	11	6.7	154	93.3	165	10	6.1	155	93.9	165
Female	14-18	Sp. Education	8	33.3	24	100	24	13	54.2	11	45.8	24
Female	14-18	Gifted	0	0	13	100	13	0	0	13	100	13
		Total	11		191		202	23		179		202

Table 21 continued

			Emotional Control					Initiate				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Male	5-6	General	1	3.4	28	96.6	29	6	20.7	23	79.3	29
Male	5-6	Sp. Education	0	0	1	100	1	0	0	1	100	1
Male	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	1		27		30	6		24		30
Male	7-8	General	8	10.7	67	89.3	75	10	13.3	65	86.7	75
Male	7-8	Sp. Education	0	0	3	100	3	1	33.3	2	66.7	3
Male	7-8	Gifted	0	0	1	100	1	0	0	1	100	1
		Total	8		71		79	11		68		79
Male	9-13	General	13	8.4	154	92.2	167	19	11.4	147	88.6	166
Male	9-13	Sp. Education	14	30.4	32	69.6	46	19	41.3	27	58.7	46
Male	9-13	Gifted	1	16.7	5	83.3	6	0	0	6	100	6
		Total	28		191		219	38		180		218
Male	14-18	General	19	10.4	163	89.6	182	42	23	141	77	183
Male	14-18	Sp. Education	14	31.1	31	68.9	45	24	53.3	21	46.7	45
Male	14-18	Gifted	1	8.3	11	91.7	12	1	8.3	11	91.7	12
		Total	34		205		239	67		173		240

Table 21 continued

			Emotional Control					Initiate				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Female	5-6	General	3	9.4	29	90.6	32	4	12.5	28	87.5	32
Female	5-6	Sp. Education	0	-	0	-	0	0	-	0	-	0
Female	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	3		29		32	4		28		32
Female	7-8	General	12	17.6	56	82.4	68	6	8.8	62	91.2	68
Female	7-8	Sp. Education	2	40	3	60	5	2	40	3	60	5
Female	7-8	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	14		59		73	8		65		73
Female	9-13	General	21	12.4	149	87.6	170	27	16.1	141	83.9	168
Female	9-13	Sp. Education	9	32.1	19	67.9	28	12	42.9	16	57.1	28
Female	9-13	Gifted	0	-	9	100	9	0	-	9	100	9
		Total	30		177		207	39		166		205
Female	14-18	General	11	6.7	154	93.3	165	12	7.3	153	92.7	165
Female	14-18	Sp. Education	11	45.8	13	54.2	24	8	33.3	16	66.7	24
Female	14-18	Gifted	0	0	13	100	13	0	0	13	100	13
		Total	22		180		202	20		182		202

Table 21 continued

			Working Memory					Planning				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Male	5-6	General	7	24.1	22	75.9	29	5	17.2	24	82.8	29
Male	5-6	Sp. Education	0	0	1	100	1	0	0	1	100	1
Male	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	7		23		30	5		25		30
Male	7-8	General	11	14.7	64	85.3	75	14	18.7	61	81.3	75
Male	7-8	Sp. Education	1	33.3	2	66.7	3	1	33.3	2	66.7	3
Male	7-8	Gifted	0	0	1	100	1	0	0	1	100	1
		Total	12		67		79	15		64		79
Male	9-13	General	20	12	147	88	167	18	10.8	149	89.2	167
Male	9-13	Sp. Education	22	47.8	24	52.2	46	21	45.7	25	54.3	46
Male	9-13	Gifted	1	16.7	5	83.3	6	2	33.3	4	66.7	6
		Total	43		176		219	41		178		219
Male	14-18	General	39	21.3	144	78.7	183	36	19.7	147	80.3	183
Male	14-18	Sp. Education	27	60	18	40	45	25	55.6	20	44.4	45
Male	14-18	Gifted	2	16.7	10	83.3	12	3	25	9	75	12
		Total	68		172		240	64		176		240

Table 21 continued

			Working Memory					Planning				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Female	5-6	General	4	12.5	28	87.5	32	5	15.6	27	84.4	32
Female	5-6	Sp. Education	0	-	0	-	0	0	-	0	-	0
Female	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	4		28		32	5		27		32
Female	7-8	General	5	7.4	63	92.6	68	6	8.8	62	91.2	68
Female	7-8	Sp. Education	2	40	3	60	5	2	40	3	60	5
Female	7-8	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	7		66		73	8		65		73
Female	9-13	General	22	12.9	148	87.1	170	20	11.8	150	88.2	170
Female	9-13	Sp. Education	16	57.7	12	42.9	28	11	39.3	17	60.7	28
Female	9-13	Gifted	0	0	9	100	9	0	0	9	100	9
		Total	38		169		207	31		176		207
Female	14-18	General	13	7.9	152	92.1	165	15	9.1	150	90.9	165
Female	14-18	Sp. Education	9	37.5	15	62.5	24	8	33.3	16	66.7	24
Female	14-18	Gifted	0	0	13	100	13	0	0	13	100	13
		Total	22		180		202	23		179		202

Table 21 continued

			Organization of Materials					Monitor				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Male	5-6	General	5	17.2	24	82.8	29	7	24.1	22	75.9	29
Male	5-6	Sp. Education	0	0	1	100	1	0	0	1	100	1
Male	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	7		23		30	7		23		30
Male	7-8	General	12	16	63	84	75	15	20	60	80	75
Male	7-8	Sp. Education	1	33.3	2	66.7	3	1	33.3	2	66.7	3
Male	7-8	Gifted	0	0	1		1	0	0	1	100	1
		Total	12		67		79	16		63		79
Male	9-13	General	23	13.8	144	86.2	167	12	7.2	155	92.8	167
Male	9-13	Sp. Education	20	43.5	26	56.5	46	15	32.6	31	67.4	46
Male	9-13	Gifted	2	33.3	4	66.7	6	1	16.7	5	83.3	6
		Total	45		174		219	28		191		219
Male	14-18	General	16	8.7	167	91.3	183	36	19.7	147	80.3	183
Male	14-18	Sp. Education	15	33.3	30	66.7	45	20	44.4	25	55.6	45
Male	14-18	Gifted	2	16.7	10	83.3	12	2	16.7	10	83.3	12
		Total	33		207		240	58		182		240

Table 21 continued

			Organization of Materials					Monitor				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Female	5-6	General	6	18.8	26	81.2	32	6	18.8	26	81.3	32
Female	5-6	Sp. Education	0	-	0	-	0	0	-	0	-	0
Female	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	6	26			32	6		26		32
Female	7-8	General	7	10.3	61	89.7	68	8	11.8	60	88.2	68
Female	7-8	Sp. Education	0	0	5	100	5	3	60	2	40	5
Female	7-8	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	7		66		73	11		62		73
Female	9-13	General	23	13.5	147	86.5	170	18	10.6	152	89.4	170
Female	9-13	Sp. Education	6	21.4	22	78.6	28	13	46.4	15	53.6	28
Female	9-13	Gifted	0	0	9	100	9	0	0	9	100	9
		Total	29		178		207	31		176		207
Female	14-18	General	3	1.8	162	98.2	165	10	6.1	155	93.9	165
Female	14-18	Sp. Education	3	13	20	87	23	5	20.8	19	79.2	24
Female	14-18	Gifted	0	0	13	100	13	0	0	13	100	13
		Total	6		195		201	15		187		202

Table 21 continued

			BRI					MI				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Male	5-6	General	1	3.4	28	96.6	29	8	27.6	21	72.4	29
Male	5-6	Sp. Education	0	0	1	100	1	0	0	1	100	1
Male	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	1		29		30	8		22		30
Male	7-8	General	11	14.9	63	85.1	74	16	21.3	59	78.7	75
Male	7-8	Sp. Education	0	0	3	100	3	1	33.3	2	66.7	3
Male	7-8	Gifted	0	0	1	100	1	0	0	1	100	1
		Total	11		67		79	17		62		79
Male	9-13	General	13	8.4	154	92.2	167	17	10.2	150	89.8	167
Male	9-13	Sp. Education	14	30.4	32	69.6	46	21	45.7	25	54.3	46
Male	9-13	Gifted	1	16.7	5	83.3	6	1	16.7	5	83.3	6
		Total	28		191		219	39		180		219
Male	14-18	General	22	12	161	88	183	42	23	141	77	183
Male	14-18	Sp. Education	14	31	31	69	45	28	62	19	42	45
Male	14-18	Gifted	2	16.7	10	83.3	12	2	16.7	10	83.3	12
		Total	38		202		240	72		170		240

Table 21 continued

			BRI					MI				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop	#CS	%CS	#NCS	%NCS	TotalPop
Female	5-6	General	5	15.6	27	84.4	32	5	15.6	27	84.4	32
Female	5-6	Sp. Education	0	-	0	-	0	0	-	0	-	0
Female	5-6	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	5		27		32	5		27		32
Female	7-8	General	11	16.2	57	83.8	68	6	8.8	62	91.2	68
Female	7-8	Sp. Education	1	20	4	80	5	2	40	3	60	5
Female	7-8	Gifted	0	-	0	-	0	0	-	0	-	0
		Total	12		61		73	8		65		73
Female	9-13	General	16	9.5	153	90.5	169	25	14.7	145	85.3	170
Female	9-13	Sp. Education	9	32.1	19	67.9	28	12	42.9	16	57.1	28
Female	9-13	Gifted	0	0	9	100	9	0	0	9	100	9
		Total	25		181		206	37		170		207
Female	14-18	General	9	5.5	156	94.5	165	11	6.7	154	93.3	165
Female	14-18	Sp. Education	12	50	12	50	24	8	33.3	16	66.7	24
Female	14-18	Gifted	0	0	13	100	13	0	0	13	100	13
		Total	20		181		202	19		183		202

Table 21 continued

			GEC				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop
Male	5-6	General	4	13.8	25	86.2	29
Male	5-6	Sp. Education	0	0	1	100	1
Male	5-6	Gifted	0	-	0	-	0
		Total	1		29		30
Male	7-8	General	11	15.1	62	84.9	73
Male	7-8	Sp. Education	1	33.3	2	66.7	3
Male	7-8	Gifted	0	0	1	100	1
		Total	11		67		79
Male	9-13	General	15	9.1	150	90.9	165
Male	9-13	Sp. Education	23	50	23	50	46
Male	9-13	Gifted	2	33.6	4	66.7	6
		Total	40		177		217
Male	14-18	General	29	16.2	150	83.8	179
Male	14-18	Sp. Education	22	50	22	50	44
Male	14-18	Gifted	2	16.7	10	83.3	12
		Total	53		182		235

Table 21 continued

			GEC				
Sex	Age	EdClassification	#CS	%CS	#NCS	%NCS	TotalPop
Female	5-6	General	5	15.6	27	84.4	32
Female	5-6	Sp. Education	0	-	0	-	0
Female	5-6	Gifted	0	-	0	-	0
		Total	5		27		32
Female	7-8	General	9	13.2	59	86.8	68
Female	7-8	Sp. Education	3	60	2	40	5
Female	7-8	Gifted	0	-	0	-	0
		Total	12		61		73
Female	9-13	General	21	12.4	148	87.6	169
Female	9-13	Sp. Education	12	42.9	16	57.1	28
Female	9-13	Gifted	0	0	9	100	9
		Total	33		173		180
Female	14-18	General	11	6.7	153	93.3	164
Female	14-18	Sp. Education	10	41.7	14	58.3	24
Female	14-18	Gifted	0	0	13	100	13
		Total	21		180		201

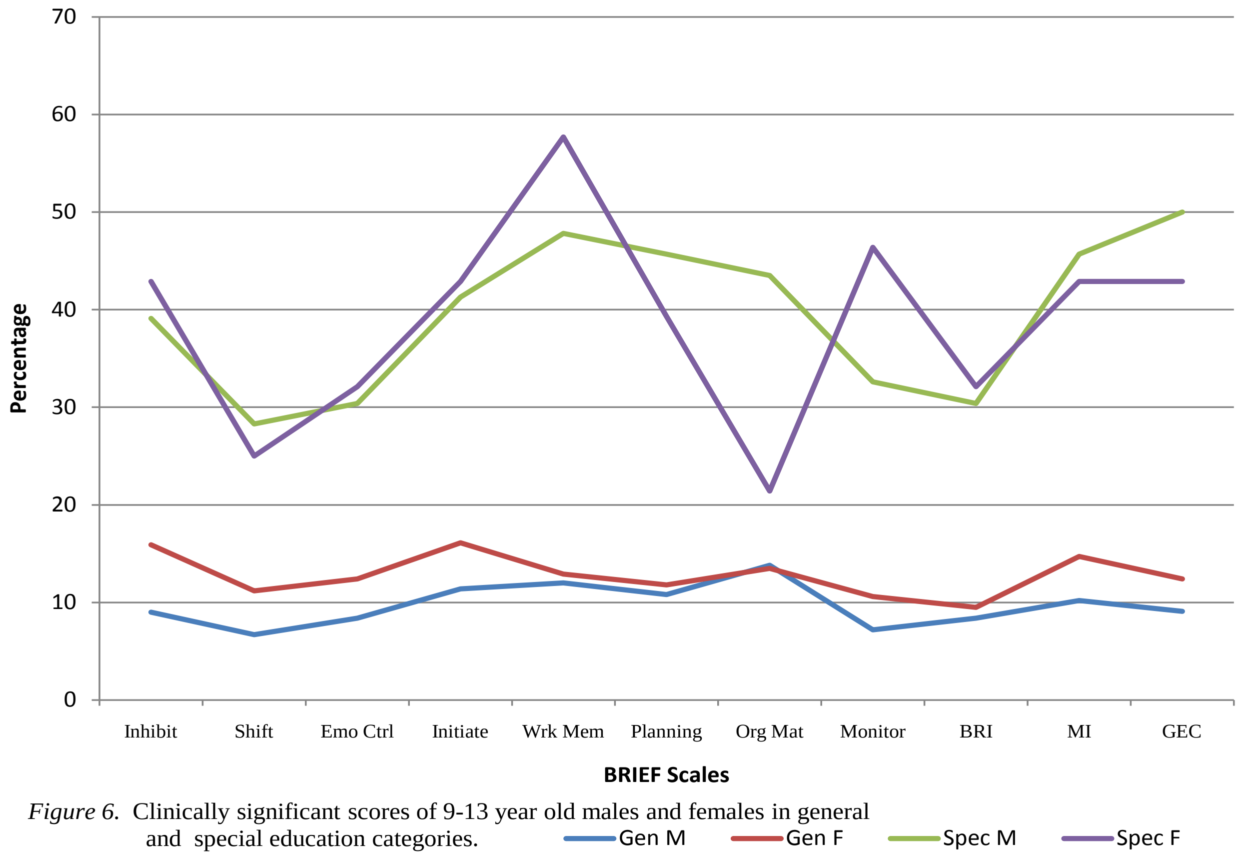

Figure 6. Clinically significant scores of 9-13 year old males and females in general and special education categories.

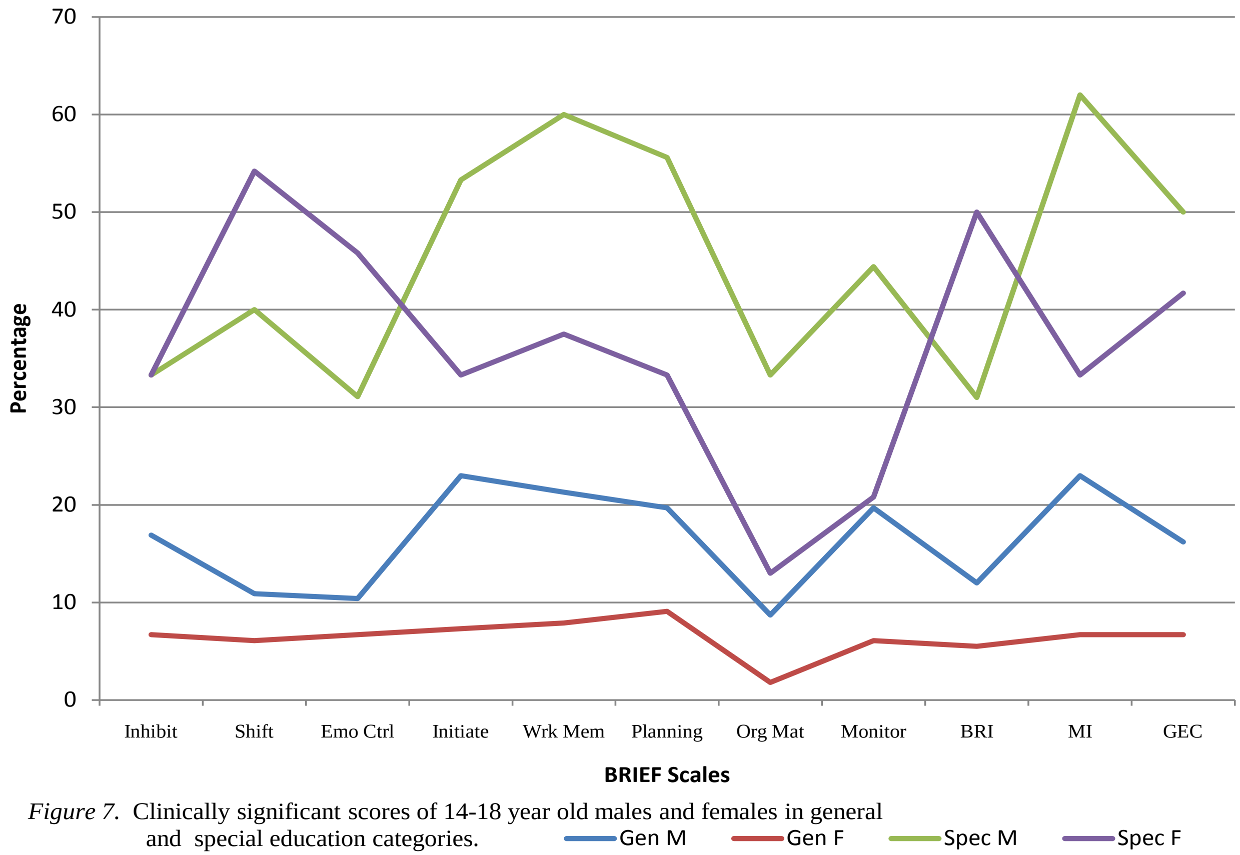

Figure 7. Clinically significant scores of 14-18 year old males and females in general and special education categories.

When examining BRIEF score percentages by age group, sex and educational classification, there are few gifted students with clinically significant scores. Therefore, Gifted classification is not included in the analysis. When comparing 9-13 year old males and females by educational classification, the graphic representation on Figure 6 indicates that General education males and females have a similar profile. The level of percentages of clinically significant scores is much lower than their Special education counterparts. Special education males exhibit the highest percentage of clinically significant scores in the areas of Working Memory and Monitor, and the lowest percentage of clinically significant scores on Organization of Materials. Special Education females display the highest number of clinically significant scores on the Global Executive Composite and Working Memory while their lowest percentage is on Shift, suggesting the highest and lowest levels of teacher perception of executive function impairment in those areas. For males, percentages of clinically significant scores range from 28.3% to 50%. For females, the range is from 21.4% to 57.7%.

When comparing 14-18 year old males and females by educational classification, the profile, as depicted on Figure 7, is quite variable. General education females display the lowest percentage of clinically significant scores across all BRIEF scales, ranging from 1.8 to 9.1%. General education males display the next highest percentage of scores, with a range of 8.7 to 23% of the population having clinically significant scores. Special education females displayed the third highest percentages, and the range was large, from 13 to 54.2%. Special education males had the highest percentage of their population with clinically significant scores, ranging from 31 to 60%. The Metacognition Index and

Working Memory scale had the highest percentages, suggesting the highest level of teacher perception of executive function impairment in those areas.

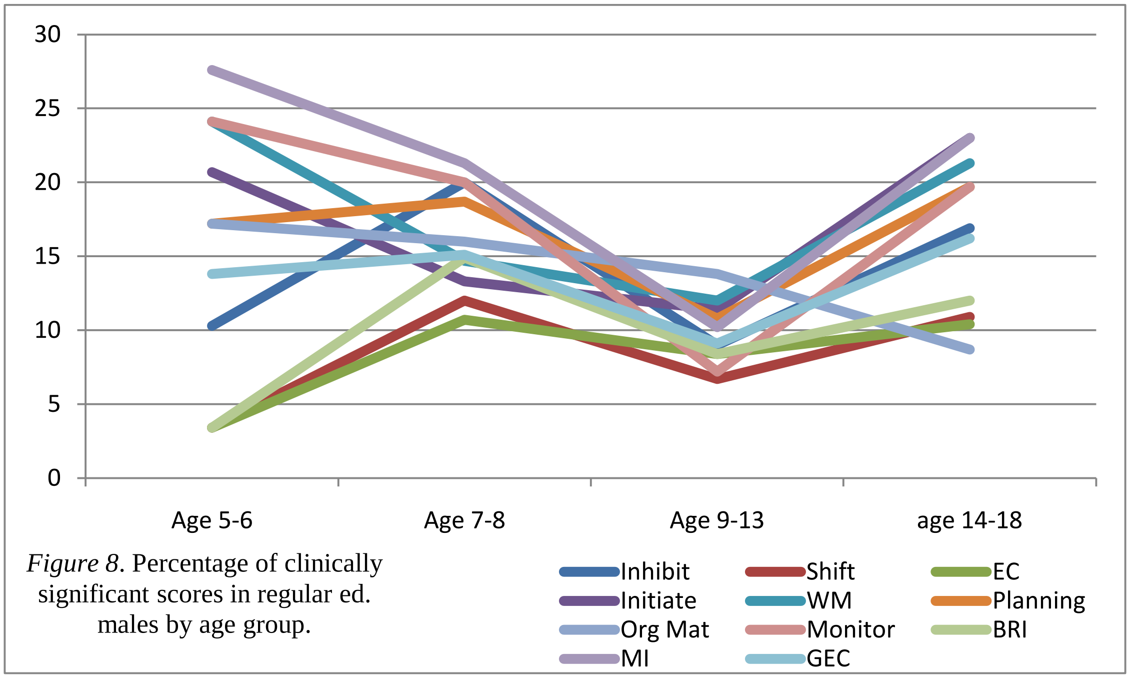

Figure 8. Percentage of clinically significant scores in regular ed. males by age group.

Figure 8 depicts the arrangement of clinically significant scores of males by age group. Across the BRIEF scales, scores are widely variable in the 5-6 age group, then appear to become more consistent, with age group 9-13 showing the lowest percentages of clinically significant scores. Then percentages increase for all scales at age 14-18 with the exception of organization of materials. Figure 9 shows the same arrangement for females, and reveals a different profile. Percentages of clinically significant scores are again widely variable at age 5-6 and at 7-9, and instead of rising at age 14-18, they trend downward. This may suggest a practical difference between males and females at the age 14-18 group.

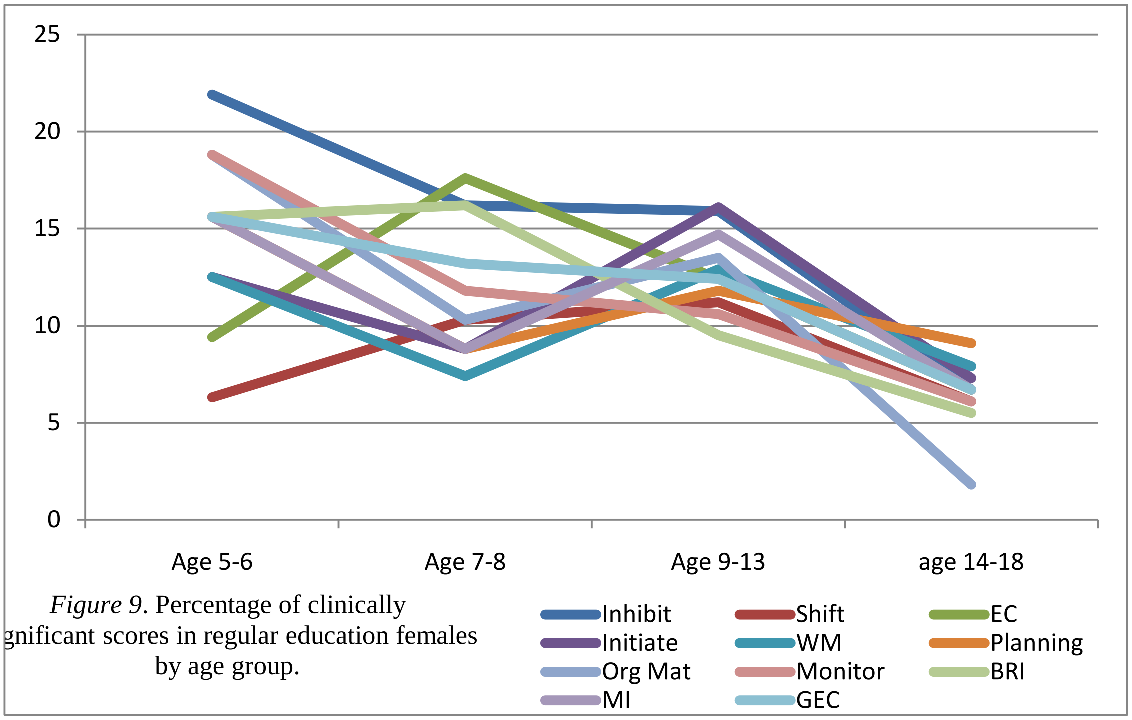

Figure 9. Percentage of clinically gnificant scores in regular education females by age group.

Question 2C. Question 2C examines the incidence of clinically significant T-scores by Age Group. Age Group consists of ages 5-6, 7-8, 9-13, and 14-18. There is no pattern to the incidence of clinically significant scores. The smallest population is age group 5-6 with 62 members. The Inhibit scale showed 10 out of 62 clinically significant scores in the 5-6 age group, which is a percentage of 16.1. On the Shift scale, only three out of 62 were clinically significant, a percentage of 5.0. On the Emotional Control scale, 4 of 62, a percentage of 6.5 were clinically significant. For Initiate, 10 of 62 were clinically significant at 16.1%. On the Working Memory scale, 11 of 62 were clinically significant 17.7%. Ten out of a population of 62 were clinically significant on Planning at 16.1%. On Organization of Materials, 11 of 62 were clinically significant, a percentage of 17.7. For Monitor, 13 of 62, or 21% were clinically significant. On the Behavior Regulation Index, 6 of 62 (9.6%) were clinically significant. On the Metacognition Index, 13 of 62 (21%) were clinically significant. On the Global Executive Composite, 9 of 62 (14.5%) were clinically significant.

The second group examined is age group 7-8. The Inhibit scale shows 36 out of 152 (24%) clinically significant scores. On Shift, 18 of 152 (18%) were clinically significant. On Emotional Control, 22 of 152 (14.5%) were clinically significant. On Initiate and Working Memory, 19 of 152 (12.5%) were clinically significant. On Planning, 23 of 152 (15.1) were clinically significant. On Organization of Materials, 20 of 152 (13.2%) were clinically significant. On Monitor, 27 of 152 (17.8%) had clinically significant scores. On the Behavior Regulation Index, 23 of 151 (15.2%) were clinically significant. On the Metacognition Index, 25 of 152 (16.4%) were clinically significant. On the Global Executive Composite, 24 of 150 (16%) were clinically significant.

Age group 9-13 is examined for incidence of clinically significant scores. The Inhibit scale shows 74 out of 427 (17.3%) clinically significant scores. On Shift, 52 of 427 (12.2%) were clinically significant. On Emotional Control, 59 of 427 (13.8%) were clinically significant. On Initiate, 77 of 424 (18.2) were clinically significant. On Working Memory, 81 of 427 (19%) were clinically significant. On Planning, 72 of 427 (16.9%) were clinically significant. On Organization of Materials, 75 of 427 (17.6%) were clinically significant. On Monitor, 60 of 427 (14.1%) had clinically significant scores. On the Behavior Regulation Index, 54 of 426 (12.7%) were clinically significant. On the Metacognition Index, 77 of 427 (18.3%) were clinically significant. On the Global Executive Composite, 74 of 424 (17.5%) were clinically significant.

The final group examined for incidence of clinically significant scores is ages 14-18. The Inhibit scale shows 66 out of 444 (15%) clinically significant scores. On Shift, 64 of 444 (14.4%) were clinically significant. On Emotional Control, 56 of 443 (12.6%) were clinically significant. On Initiate, 89 of 444 (20%) were clinically significant. On Working Memory, 92 of 444 (20.7%) were clinically significant. On Planning, 89 of 444 (20%) were clinically significant. On Organization of Materials, 40 of 443 (9%) were clinically significant. On Monitor, 75 of 444 (16.9%) had clinically significant scores. On the Behavior Regulation Index, 60 of 444 (13.5%) were clinically significant. On the Metacognition Index, 91 of 444 (20.5%) were clinically significant. On the Global Executive Composite, 76 of 438 (17.4%) were clinically significant. Table 22 shows the incidence of clinically significant BRIEF scores by Age Group. Figure 10 is the graphic representation of these same scores.

Table 22

Incidence of Clinically Significant BRIEF Scores by Age Group

	BRIEF SCALES						
Age	CS		Not CS		Total		
Group	N	%	N	%	N	Pop%	%CS
			Inhibit				
5-6	10	5.7	52	5.7	62	5.7	16.1
7-8	36	14.8	126	13.9	152	14.0	24.0
9-13	74	42.0	353	38.8	427	39.4	17.3
14-18	66	37.5	378	41.6	444	40.9	15.0
Total	176		909		1085		16.2
			Shift				
5-6	3	2.2	59	6.2	62	5.7	5.0
7-8	18	13.1	134	14.1	152	14.0	18.0
9-13	52	38.0	375	39.6	427	39.4	12.2
14-18	64	46.7	380	40.1	444	40.9	14.4
Total	137		948		1085		12.6
			Emotional Control				
5-6	4	2.8	58	6.2	62	5.7	6.5
7-8	22	15.6	130	13.8	152	14.0	14.5
9-13	59	41.8	368	39.0	427	39.4	13.8
14-18	56	39.7	387	41.0	443	40.9	12.6
Total	141		943		1084		13.0
			Initiate				
5-6	10	5.1	52	5.9	62	5.7	16.1
7-8	19	9.7	133	15.0	152	14.0	12.5
9-13	77	39.5	347	39.1	424	39.2	18.2
14-18	89	45.6	355	40.0	444	41.0	20.0
Total	195		887		1082		18.0
			Working Memory				
5-6	11	5.4	51	5.8	62	5.7	17.7
7-8	19	9.4	133	15.1	152	14.0	12.5
9-13	81	39.9	346	39.2	427	39.4	19.0
14-18	92	45.3	352	39.9	444	40.9	20.7
Total	203		882		1085		18.7

Table 22 continued

Age Group	CS N	CS %	Not CS N	Not CS %	Total N	Total Pop%	%CS
BRIEF SCALES							
Planning							
5-6	10	5.2	52	5.8	62	5.7	16.1
7-8	23	11.9	129	14.5	152	14.0	15.1
9-13	72	37.1	355	39.8	427	39.4	16.9
14-18	89	45.9	355	39.8	444	40.9	20.0
Total	194		891		1085		17.9
Organization of Materials							
5-6	11	7.5	51	5.4	62	5.7	17.7
7-8	20	13.7	132	14.1	152	14.0	13.2
9-13	75	51.4	352	37.5	427	39.4	17.6
14-18	40	27.4	403	43.0	443	40.9	9.0
Total	146		938		1084		15.8
Monitor							
5-6	13	7.4	49	5.4	62	5.7	21.0
7-8	27	15.4	125	13.7	152	14.0	17.8
9-13	60	34.3	367	40.3	427	39.4	14.1
14-18	75	42.9	369	40.5	444	40.9	16.9
Total	175		910		1085		16.1
BRI							
5-6	6	4.2	56	6.0	62	5.7	9.6
7-8	23	16.1	128	13.6	151	13.9	15.2
9-13	54	37.8	372	39.6	426	39.3	12.7
14-18	60	42.0	384	40.9	444	41.0	13.5
Total	143		940		1083		13.2
MI							
5-6	13	6.3	49	5.6	62	5.7	21.0
7-8	25	12.1	127	14.4	152	14.0	16.4
9-13	77	37.4	350	39.8	427	39.4	18.3
14-18	91	44.2	353	40.2	444	40.9	20.5
Total	206		879				19.0
GEC							
5-6	9	4.9	53	5.9	62	5.8	14.5
7-8	24	13.1	126	14.1	150	14.0	16.0
9-13	74	40.4	350	39.3	424	39.5	17.5
14-18	76	41.5	362	40.6	438	40.8	17.4
Total	183		891		1074		17.0

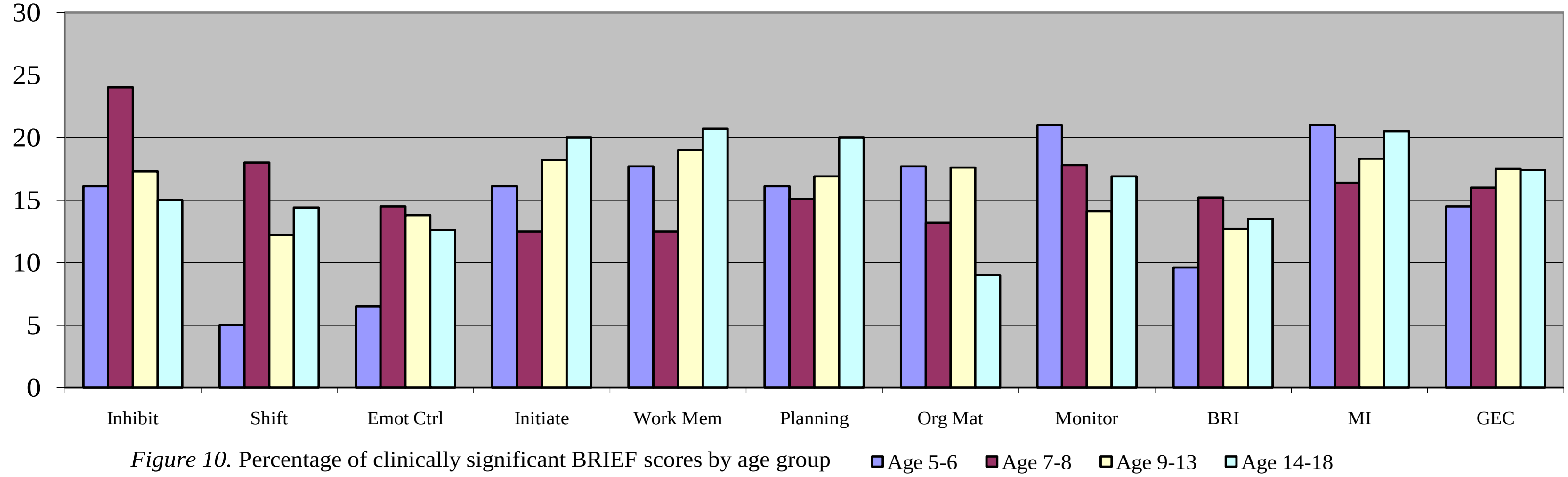

Figure 10. Percentage of clinically significant BRIEF scores by age group

Table 23

Multivariate Analysis of Variance (1-way) of BRIEF scales by Age Group

DESCRIPTIVE STATISTICS -

	Inhibit				Shift				Emotional Control			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
5-6	62	.16	.37	0-1	62	.05	.22	0-1	62	.06	.25	0-1
7-8	149	.17	.37	0-1	149	.11	.32	0-1	149	.14	.35	0-1
9-13	420	.17	.38	0-1	420	.12	.33	0-1	420	.14	.35	0-1
14-18	436	.14	.34	0-1	436	.13	.34	0-1	436	.12	.32	0-1
Total	1067	.16	.36	0-1	1067	.12	.33	0-1	1067	.13	.33	0-1

	Initiate				Working Memory				Monitor			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
5-6	62	.16	.37	0-1	62	.18	.39	0-1	62	.21	.41	0-1
7-8	149	.12	.33	0-1	149	.12	.33	0-1	149	.17	.38	0-1
9-13	420	.18	.38	0-1	420	.19	.39	0-1	420	.14	.35	0-1
14-18	436	.19	.39	0-1	436	.20	.40	0-1	436	.16	.37	0-1
Total	1067	.18	.38	0-1	1067	.18	.39	0-1	1067	.16	.36	0-1

	Planning				Org. of Materials				BRI			
Group	n	Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range
5-6	62	.16	.37	0-1	62	.18	.38	0-1	62	.10	.30	0-1
7-8	149	.14	.35	0-1	149	.12	.33	0-1	149	.15	.35	0-1
9-13	420	.17	.37	0-1	420	.17	.38	0-1	420	.13	.33	0-1
14-18	436	.19	.39	0-1	436	.08	.27	0-1	436	.12	.33	0-1
Total	1067	.17	.38	0-1	1067	.13	.33	0-1	1067	.13	.33	0-1

	MI				GEC			
Group	n	Mean	SD	Range	n	Mean	SD	Range
5-6	62	.21	.41	0-1	62	.15	.36	0-1
7-8	149	.16	.37	0-1	149	.16	.37	0-1
9-13	420	.18	.38	0-1	420	.18	.38	0-1
14-18	436	.20	.40	0-1	436	.17	.38	0-1
Total	1067	.18	.39	0-1	1067	.17	.38	0-1

ANALYSIS OF VARIANCE -

Test Name	Value	Approx F	Hyp. df.	Error df.	p.
Pillai's Trace	.071	2.34	33	3165	<.001
Wilks' Lambda	.930	2.35	33	3103	<.001
Hotelling's Trace	.074	2.35	33	3155	<.001
Roy's Largest Root	.044	4.26	11	1055	<.001

Source of Variation	Mean df	Square	F	*η2*	p
Organization of Materials	3	.678	6.138	.017	<.001
Residual	1063	.110			

A one-way between-groups Multivariate Analysis of Variance was performed to investigate age group differences on the BRIEF. Eleven dependent variables were used: Behavioral Regulation Index (BRI), Metacognition Index (MI), Global Executive Composite (GEC), and then 8 individual clinical scales (inhibit, initiate, working memory, planning, organization of materials, monitor and shift). The independent variable was age group. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity. Although the assumption of homogeneity of variance-covariance matrices was violated, no corrections were needed. The variance matrices were statistically significant because of the large sample size. Because several variables (initiate, working memory, and organization of materials) violated the assumption of homogeneity of error variance, a more conservative alpha level (.01) will be used for those variables. There was a statistically significant difference between age groups on the combined dependent variables, F (3, 1063) = 2.35, p <.0005, Wilks' Lambda <.0005; partial eta squared = .024. Table 23 represents the MANOVA of BRIEF Scales by Age Group. When the results for the dependent variables were considered separately, the only difference to reach statistical significance was organization of materials, using a Bonferroni adjusted alpha level of .005 for those that did not violate the equality assumption (inhibit, shift, emotional control, planning, monitor, BRI, MI and GEC) and .0009 for those that did (initiate, working memory, and organization of materials). A one-way between groups Analysis of Variance was performed to investigate the differences between age groups for organization of materials. There was a difference between the age groups of 9-13 and 14-18; eta squared = .017. The mean difference between these groups is .085, or 8.5%. This is considered a small effect size (Cohen, 1988). Results indicate that students ages 14-18 are perceived by their teachers to have less difficulty with organization of materials than students ages 9-13.

Summary Question 2

Question 2 examined the percentages of clinically significant scores on the BRIEF within and among the variables of sex, educational classification and age group. Within the variable of sex, there was no significant difference between teachers' perception of executive functioning. Within educational classification, the special education group displayed higher percentages of clinically significant scores than regular education or gifted students on all areas measured by the BRIEF. Within the variable of age group, there was a difference between students ages 9-13 and students ages 14-18 on Organization of Materials. Students ages 14-18 were rated by their teachers as having significantly less executive function impairment in their organization of materials.

Research Question 3

Question 3 examines the two-factor solution for the Behavior Rating Inventory of Executive Function (BRIEF) in the school district sample to determine if the 8 BRIEF sub-scores confirm the two factors Behavioral Regulation and Metacognition.

Preliminary screening. Initial exploratory factor analyses by the BRIEF authors included both normative and clinical samples; therefore, it is appropriate to use the full District sample to conduct the confirmatory factor analysis. Examination of the dataset revealed that 5 of the 1119 participants (<.5%) had incomplete data on one or more of the items. Due to the large sample size, cases with missing data were deleted from all analyses. Remaining items were screened for univariate outliers, which were defined as responses greater than 3.29 standard deviations from the mean (Tabachnick and Fidell, 2007). A total of 133 outliers were detected (76 outliers were detected for “shift”, 31 for “organizational materials”, and 26 for “emotional control”) and subsequently deleted from the sample. After deleting these cases, complete data from 978 participants remained.

Kline (2005) recommends examining and correcting for violations of univariate normality before screening for multivariate normality. The criteria for univariate normality utilized in this study were Skew between -2.0 and 2.0 and Kurtosis between -7.0 and 7.0 (Kline, 2005). Using these criteria, there was evidence for substantial skew and kurtosis prior to deleting outliers. However, all variables were sufficiently normally distributed after outliers were removed from the sample.

All variables included in the path analysis were also screened for multivariate outliers using a regression-based method described by Tabachnick and Fidell (2007). With 8 variables to be included in the regression analysis, the critical $\chi^2 = 26.1$ (Tabachnick & Fidell, 2007). Thus, multivariate outliers were operationalized as cases with Mahalanobis Distance Values greater than 26.1. Using this method, 55 multivariate outliers were detected and deleted from analyses. Therefore, the subsample included in all subsequent analyses was comprised of 923 participants. It should be noted that this sample size exceeded the recommended sample size for a CFA with 8 variables (e.g., Jackson, 2003; Kline, 2005).

CFA procedures also assume that data are multivariate normal (Kline, 2005), meaning that all variables are assumed to be normally distributed, the joint distribution of any 2 items yield a distribution that is bivariate normal, and scatterplots of any two items are linear and homoscedastic (Kline, 2005). Addressing issues of univariate and multivariate outliers and univariate normality usually corrects for any issues of multivariate normality (Kline, 2005; Tabachnick & Fidell, 2007). Correlations and descriptive statistics for all 8 variables are displayed in Table 24.

Table 24

Means, Standard Deviations, and Intercorrelations of Measures (n = 923)

Variables	Range		*M*	*SD*	1	2	3	4	5	6	7
	Min	Max									
1. Inhibit	42	84	49.3	7.6	--						
2. Shift	42	73	47.9	6.1	.46*	--					
3. EC	43	76	48.5	6.1	.54*	.70*	--				
4. Initiate	39	88	49.9	9.4	.50*	.49*	.32*	--			
5. WM	38	96	49.7	9.4	.60*	.48*	.33*	.81*	--		
6. Planning	38	91	49.1	9	.53*	.53*	.36*	.82*	.84*	--	
7. MO	42	81	48.4	6.9	.50*	.41*	.29*	.48*	.58*	.62*	--
8. Monitor	38	83	49.1	8.5	.78*	.51*	.48*	.74*	.78*	.79*	.61*

*$p < .001$

Model specification. The Chi-Square statistic was used to evaluate model fit. A non-significant chi-square indicates good fit. To permit simple comparisons between the hypothesized and revised models, CFA analyses are presented in Table 25. Based on the p-value, the hypothesized 2-factor model with 3 items and 5 items on BRI and MI, respectively, did not fit the data well. Therefore, the hypothesized model was modified. All items with loadings lower than .60 were removed from the model (Kline, 2005). Using this criterion, 2 items were deleted: Inhibit was removed from BRI and Material Organization was removed from MI. This revised model also did not fit the data based on the p-value.

Modification indices were examined to determine if items cross-loaded on other factors. These indices provide post-hoc suggestions for parameters that should be added to the model. Thus, if it is recommended that a pathway from an item to another factor be added, there is evidence that the item cross-loads. In the present analysis, there was evidence that Monitor may cross-load across both factors. Therefore, a third model was examined that excluded this item. As can be seen in Table 26, the Chi-square value = 5.25, p-value = .26 and degree of freedom = 4 provided evidence of a good fit with observed data. Therefore, this model was selected as the final model. Table 25 presents the standardized and unstandardized factor loadings. The correlation between BRI and MI was .54. According to Cohen's (1988) conventions, this effect size is in the large range.

Table 25. Results of Confirmity Factor Analyses of Hypothesized and Revised Models (n = 923)

Model	χ^2	*df*	*p-value*
Hypothesized Model	872.18*	19	<.001
Revision 1	113.97*	8	<.001
Revision 2	5.24	4	.26

*$p < .001$

Note. All values are rounded to two decimal places.

Table 26.

Standardized and Unstandardized Loadings for the Final Model (n = 923)

		BRI		MI	
Item	Description	Unstand	Stand	Unstand	Stand
Shift	*Ability to make transitions, problem solve flexibly, alternate attention and change focus*	1.00 (.--)	1.00		
EC	*Emotional Control-ability to modulate emotions*	.68 (.04)	.69		
Inhibit	*Inhibitory control-ability to inhibit emotions*			1.00 (--)	.88
WM	*Working Memory-capacity to hold information in mind for the purpose of completing a task*			1.02 (.03)	.91
Planning	*Ability to manage current and future oriented task demands*			1.01 (.02)	.93

Summary Question 3

Research question three examined the BRIEF Factors using the district sample data and compared them to the Factor design presented by the BRIEF authors. Results of the Confirmatory Factor Analysis using the district sample data do not support a two factor solution using all of the subscales as described by the BRIEF authors. In order to find a good fit, subscales with loadings lower than .60 were removed from the model. Inhibit was removed from the Behavior Regulation Index and Organization of Materials was removed from the Metacognition Index. With this first revision, the p-value showed that there was not a good fit with the data. Another revision was made by removing the subscale Monitor because it appeared to cross-load on both Indexes. The final model was a two factor solution with Shift and Emotional Control loading on the Behavioral Regulation Index and Inhibit, Working Memory and Planning loading on the Metacognition Index. This resulted in a medium effect size. Just over 70% of the variance between the two factors is not shared, and is therefore unique.

Chapter IV Summary

Research question one compared the School District's general education population to the Normative sample. Five to six year old District males and females are comparable to the Normative sample. Seven to eight year old males demonstrate a higher level of teacher perception of difficulty in Organization of Materials. Seven to eight year old girls demonstrate no difficulties compared to the Normative sample. Males and females ages 9-13 are comparable to the Normative sample. Males ages 14-18 demonstrate a higher level of Monitor difficulty than the Normative sample as perceived by the teachers. Females ages 14-18 were comparable to the Normative sample on all areas with the exception of Organization of Materials, where the teachers perceive lower levels of clinically significant scores. Question 2 examined the percentages of clinically significant scores on the BRIEF within and among the variables of sex, educational classification and age group. Within the variable of sex, there was no significant difference between teachers' perception of executive functioning. Within the variable of age group, there was a difference between students ages 9-13 and students ages 14-18 on Organization of Materials. Students ages 14-18 were rated by their teachers as having significantly less executive function impairment in their organization of materials.

Within educational classification, the special education group displayed higher percentages of clinically significant scores than regular education or gifted students on all areas measured by the BRIEF. Special education males exhibit the highest percentage of clinically significant scores in the areas of Working Memory and Monitor, and the lowest percentage of clinically significant scores on Organization of Materials. Special Education females display the highest number of clinically significant scores on the Global Executive Composite and Working Memory while their lowest percentage is on Shift, suggesting the highest and lowest levels of teacher perception of executive function impairment in those areas. General education females display the lowest percentage of clinically significant scores across all BRIEF scales, ranging from 1.8 to 9.1%. General education males display the next highest percentage of scores, with a range of 8.7 to 23% of the population having clinically significant scores. Special education females displayed the third highest percentages, and the range was large, from 13 to 54.2%. Special education males had the highest percentage of their population with clinically significant scores, ranging from 31 to 60%. The Metacognition Index and Working Memory scale had the highest percentages, suggesting the highest level of teacher perception of executive function impairment in those areas.

In regards to research question 3, results of the Confirmatory Factor Analysis using the district sample data do not support a two factor solution using all of the subscales as described by the BRIEF authors. In order to find a good fit, Inhibit was removed from the Behavior Regulation Index and Organization of Materials was removed from the Metacognition Index. With this first revision, the p-value showed that there was still not a good fit with the data. Another revision was made by removing the subscale Monitor as it appeared to cross-load on both Indexes. The final model was a two factor solution with Shift and Emotional Control loading on the Behavioral Regulation Index and Inhibit, Working Memory and Planning loading on the Metacognition Index. This resulted in a medium effect size. Just over 70% of the variance between the two factors is not shared, and is therefore unique.

CHAPTER V

DISCUSSION

This research used archival data of teachers' ratings of 1119 students using the Behavior Rating Inventory of Executive Functioning (BRIEF) to examine teacher perception of executive functioning within the school districts. Data were analyzed using sex, educational status, and chronological age group criteria. This research is an important step toward understanding executive functioning as it manifests itself in a whole district setting, in both general and specialized populations. Executive functioning is defined as a collection of cognitive processes that are responsible for guiding, directing, and managing behavior toward the pursuit of a goal-directed task. Historically, executive functioning has been researched primarily using specialized populations of individuals with neurological disease or injury, including Attention Deficit Hyperactivity Disorder (Barkley, 2006; Dawson & Guare, 2004; Lezak, 1995). The BRIEF has traditionally been used on individuals with neurological issues (Donders, 2002). This study is the first to provide executive functioning data from a large population of typical students as well as gifted students. It is the only study that examines a rating scale to determine if it can provide a useful and reliable measure of a whole group population. The only studies that have previously examined executive functioning of typically developing individuals are functional Magnetic Resonance Imaging (fMRI) studies. Those studies were conducted using a few typically developing individuals longitudinally (Giedd, et. al, 1999). This study provides a snapshot of a typical school district in terms of executive functioning as measured by the BRIEF. This study also provides evidence that the BRIEF can be useful as a screener for a school-wide population in addition to its' traditional uses with those with suspected neurological difficulty. Results indicate it is also a good assessment for special education identification.

The No Child Left Behind Act, with an emphasis on Pennsylvania State System of Assessment (PSSA) testing outcomes and punitive consequences for not meeting standards has pushed aside the importance of other aspects of education such as executive functioning or metacognition. Teachers are under great pressure to have students produce high achievement test scores, and teaching to that goal leaves little time or motivation for enhancing cognitive development by way of more process-oriented teaching (Haywood, 2010). Improved executive functioning has been shown to increase academic achievement (Meltzer, Pollica & Barzillai, 2007). This study shows the importance of addressing executive functioning in a school-wide setting as well as with specific populations.

School Sample as Compared to Normative Sample

Results indicate that the whole district population norms were essentially similar to the BRIEF norms. Only two select areas were higher, and only one of those had a medium effect size. In one area the district population demonstrated lower levels. The Global Executive Composite (GEC) and Index scales (Metacognition Index (MI) and Behavioral Regulation Index (BRI) were comparable to the normative sample in all measured groups. Males, ages 7-8 are rated as displaying a small effect size of a higher number of problems measured by the Organization of Materials scale than the normative sample. Boys ages 14-18 are rated as displaying a higher number of problems measured by the Monitor scale, with a medium effect size. Girls age 14-18 demonstrated less

Organization of Materials difficulty than the normative sample. This indicates that this sample population is not significantly different from the normative population. Results can therefore be of use to make statements about larger groups.

Comparison of Males and Females

There were no significant differences found between the incidence of clinically significant scores in males and females as a whole. For practical purposes, the incidence of clinically significant scores in the general education male population was higher than the incidence in the general education female population. This may be an area to explore with further research. General education males may benefit from interventions targeted at executive function difficulties more so than females in the general education population, particularly in metacognitive strategies such as planning, initiation and monitor skills. This study supports metacognitive research which indicates that females tend to develop these skills at an earlier stage than males (Vygotsky, 1978).

Educational Classification

The special education group was comprised of primarily students with learning disabilities. Mental retardation was not represented in the sampled population. Results confirm previous research results, which indicate that special education students have significantly higher numbers of clinically significant symptoms of executive dysfunction in all BRIEF scale areas. Monitoring skills do not develop appropriately in this population as a whole. General education and gifted education students' rates are similar and significantly lower than special education students' rates of clinically significant scores. This is consistent with previous research and underscores the need to address executive function in intervention and support for special education students. Executive function deficits are often mislabeled as laziness, lack of effort and motivation. If special education students overwhelmingly demonstrate executive function deficits and interventions are not provided, this may contribute to the underachievement and dropout rates of these students. Because this study is of teachers' perceptions, education of teachers about executive function is of paramount importance.

Gifted

Identification of giftedness in Pennsylvania is firmly defined based on an IQ of 130 and/or multiple indicators of giftedness. In the current research, 5 of 44 gifted students demonstrated elevated scores on one or more variables. This number was too small to do meaningful in-depth statistical analysis. However, in terms of gifted research, data from 44 formally identified gifted students is meaningful. There was no significant difference between gifted and general education students, and both were rated as demonstrating significantly lower teacher perception of executive function impairment than special education students. In a comparison of the incidence of clinically significant scores, the population of students identified as gifted had the lowest incidence. This finding should help to dispel myths about giftedness. Gifted students as a whole displayed exemplary executive functioning across all domains. Gifted students tend to engage cognitive resources to support more efficient strategies (Graham et. al., 2010). Results confirm that high cognitive function and executive function skills are related, and both may be indicators of giftedness (Mueller, 2008).

The students in this study with elevated scores also likely had comorbid issues, such as emotional disturbance, ADHD, or learning disabilities. Metacognitive impairments are more likely in these populations (Kuss, 2007; Lovett & Lewandowski, 2006). Given the relatively small number of the gifted population with clinically significant scores, it is hypothesized that gifted students with executive function difficulties would be fairly easy to identify by those who work with them, even if co-occurring disabilities were not formally identified (Hannah & Shore, 1995). Individualized instruction could then be incorporated to address these issues (Crim, Hawkins, Ruban & Johnson, 2008).

Age Group

Students age 14-18 displayed a significantly lower incidence of clinically significant scores on the Organization of Materials scale. Figure 9 showed that most scales at age 14-18 increased for males. Organization of Materials was the only scale that did not. For females, Organization of Materials showed the largest reduction in incidence. Based on the results of this study, executive function interventions at the high school level may be most appropriately directed at males and should probably not focus on organization of materials. Assistance in this area with environmental factors may also be helpful. This age group corresponds with high school, and results may reflect changes in environmental or expectation factors. It would be worthy of further study to determine the grade level distribution of clinically significant scores as a means to more specifically target interventions for males. For example, the concentration of clinically significant scores could be at the 9^{th} grade level, which may reflect difficulty with the transition from middle to high school. This may be due to many factors. If the concentration were at the 12^{th} grade level, it could be indicative of looking forward to graduation and less interest in current educational functioning. This is sometimes referred to as “senioritis”. Further correlations may be found with further research into grade level executive functioning.

A limitation to these results is that they are from teacher perception of executive functioning. One important future direction would be to assess males and females using the BRIEF and direct measures of executive function to determine if the gap in incidence still occurs. If so, then curriculum interventions for males would be an appropriate step. If the results are not consistent, then the teachers' perceptions should be further assessed. Sex differences could be a factor in the manner in which males are perceived, which could have an impact on their school performance. Dropout rates, school dissatisfaction and underachievement are all areas that could be impacted by real or perceived executive function difficulty. It is recommended that general and special education males be further studied to explore these issues as well.

As is postulated by fMRI research, a critical period of opportunity for teaching of executive skills is at approximately age 11-12. Formal development and the increase of executive functions in cortical areas increase (Giedd et al, 1999). This would indicate that practice of executive skills to promote development of neural connections and brain structures to support executive functioning skills is critical at this time. (Calkins & Bell, 2010). Dawson and Guare (2009) indicate that when children and adolescents perform tasks that require executive functioning skills, they rely on the prefrontal cortex to do all the work rather than distributing the workload to other specialized regions of the brain, providing critical opportunities to enhance learning and development of executive skills. If neural connections for these skills are not supported through appropriate skills development, underachievement, lack of organization, planning, memory problems and a lack of strategies to address these problems begin to significantly impact students (Wilson, 1986; Yurgelin-Todd, 2007). If these problems continue, they become attitudinal (Taylor, 1999; Wahlstedt, Thorell & Bohlin, 2008). This could account for the higher incidences found in the research. It is recommended that executive function specific skills be taught to this particular population and evaluated to determine if this impacts their development of critical skills. Research has shown that cognitive processes – comparing, classifying, searching for solutions, scanning one's knowledge base, establishing logical relations among events- are modifiable (Haywood, 2010), and metacognition – using one's own judgments to guide behavior, the ability to self regulate and know what is in the mind (Son, 2010) knowledge of one's own thoughts and thought processes (Piaget 1976) - can be taught (Fox & Riconscente, 2008).

Threats to Validity

Internal Threats to Validity

The internal threats to validity encountered with this research involve instrumentation. The rating scale measures teacher perception of executive functioning, and there were multiple raters. The effects of one teacher's response style or perception might be different from another's, and as such, if multiple ratings of the same student were made, a more reliable estimate of the student's true executive functioning would have been seen. Due to the size of the rated population, only one rating of each student was possible for the school district. At the elementary school level, teachers know their students all through the day, in academic and social situations. They were much more likely to have an overall opinion of the student's executive functioning. At the middle and high school levels, teachers may have only seen the student one time per day, always in the same discipline, and therefore gave a narrow snapshot of the student's executive functioning. A direction for further research would be to sample a population of general education students and have multiple raters complete the forms to take an average for the student. Another direction would be to use multiple ratings of executive function of a sample population of general education students.

The database provided by the school district was anonymous, and the teachers who rated the students could not be selected, so there was no ability to see if one teacher tended to rate in a certain manner that may have impacted scores. There are validity measures in the BRIEF, and those that were elevated on those scales were excluded from the study, but a general pervasive view of students, either positive or negative, may exist and cannot be controlled. Teachers rated both males and females, so the sex differences found would not likely be due to an overall response set or lack of understanding of executive functioning. A generally held negative view of executive functioning in males is possible, but not likely. Research indicates that females tend to mature faster than boys in many ways, including executive functioning (Brocki & Bohlin, 2004; Codding, Lewandowski & Gordon, 2001; Giedd, 2004; Manning, 2002).

Another limitation is that teacher perception of executive functioning may not be the same thing as an actual measure of executive functioning, and therefore, these results can only be generalized as a teacher's perception of executive functioning. Differences found, whether real or perceived, are still important because they impact student performance, esteem and outcomes.

External Threats to Validity

Sampling was a possible external threat to validity for the initial data collection by the district because parents were able to opt out their students, and students were also able to opt themselves out. If those who chose not to be in the study were significantly dissimilar from their peers, this may have influenced the results. However, due to the large size of the sample, this is seen as unlikely.

These results can be compared to other public school districts of similar demographics. However, there are many other school districts with differing demographics that may have different results from a study such as this. Further research using large, urban, ethnically diverse districts may yield different results.

These results may differ from schools that have differing grade level clusters. For instance, the research district consisted of three K-4 elementary schools, one 5-8 middle school and one 9-12 high school. A school district with a K-6 elementary school and a 7-12 high school, for instance, may demonstrate different results due to environmental factors.

Another external threat to validity is the potential difference in scope of knowledge of students by their raters. In the elementary school, the teacher who completed the rating scale had the student all day for every subject, and could therefore make a more global rating of executive functioning. At the middle school and high school levels, the teachers may only see the students they are rating for one class in the morning, for instance, or one class in the afternoon. Therefore, they would be able to give a more specific rating based on their knowledge of those students, which might differ based on time of day or subject.

Examples of Executive Functioning Interventions

The school district look at grade level preliminary results of the district project resulted in several actions, which are examples of executive function interventions. The fourth grade and fifth grade data were nearly identical, yet the presentation of the fifth grade students was significantly different. Fifth grade students were frequently referred for intervention due to problems with organization, having their materials, completing homework, and learning difficulties. The school determined that the fifth grade, which is the first middle school grade, should more closely resemble the fourth grade in terms of support and expectations. As a result, the fifth grade no longer moved freely every period. Instead, they developed pods, where class exchanges happened less frequently, and the class moved as a whole. Social studies and science were taught by the students' homeroom teachers to foster teacher student connections. A tutoring program was offered in the mornings and an academic support period embedded into the schedule at the end of the day. This resulted in a 95% reduction in referrals, with a 100% reduction in referrals for executive function difficulty (organization, not having materials, forgetting homework). All referrals were for learning difficulty and came from the tutoring program. Use of classroom accommodations and modifications increased significantly, as would be suggested by research (Waters & Schneider, 2010). The principal of the middle school also developed a check-in program for the entire middle school for those who had behavioral infractions, on the assumption that they needed to strengthen their connectedness to a mentor at school, and increased motivation by providing group rewards which consisted of the principal taking the students out for a movie, dinner, ball game, or other excursions periodically. Although statistics were not recorded, observationally there were fewer behavior problems and increased achievement by those students, an outcome suggested by other researchers (Wright, 2009).

An academic support period was embedded into the schedule for all of the middle school grades to provide structure for completion of work as well as academic assistance.

At the high school level, a mentoring program was begun at the ninth grade level and supported study halls were added to the schedule. Previously the ninth grade did not have any study halls, and it was not uncommon for 25-30% of the student body to fail at least one class in ninth grade. Interventions continue to be revised at the high school level so there is no outcome data at this time. A coteaching program was initiated at both the middle and high school levels as well because research indicates that coteaching may improve academic achievement (Kloo and Zigmond, 2008). Preliminary results indicate that PSSA scores increased for those grade levels that were first to initiate coteaching.

Peer mentoring has recently been introduced, and the first group completed training the summer of 2009. There is no data to indicate results, but the involved parties seem to be enjoying the process.

Summary and Conclusions

Executive functioning is an important factor to consider in school functioning. In at least one school district, definite deficits were found in executive functioning that could be identified across grades and sexes that suggest specific school wide and class wide interventions. Special education students continue to struggle with executive function issues. A majority of special education students display executive functioning elevations as measured by the BRIEF. Males consistently display a higher incidence of executive functioning elevations than females. As Response to Intervention (RTI) on the national level and Response to Intervention and Instruction (RTIi) on the Pennsylvania level become educational mandates, executive functioning interventions should become commonplace as well. This research shows the need for Tier I, core instructional interventions which occur class- and school-wide, executive function interventions, particularly during developmental phases. Support for executive functions may reduce the need for special education identification. Within the special education population, support for executive functions, and not just content support, may increase academic functioning for these students. Many if not most interventions should be directed at executive functions instead of exclusive content based tutoring. It is predicted that supportive executive function interventions would ultimately result in better academic functioning, use of appropriate strategies and skills for problem solving, better organization, increased feelings of school satisfaction and esteem, less behavioral and emotional concerns, and reduced underachievement including dropout for all students.

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Appendix A – Consent Form

Dr. C. Joyce Nicksick
Superintendent of Schools
Wilmington Area School District

February 8, 2008

Indiana University of Pennsylvania
Institutional Review Board
Dissertation Committee

To Whom It May Concern:

This letter serves as my permission for Cynthia Wright, district school psychologist, to use archival data collected by the district for use in her doctoral dissertation, entitled: Executive functioning Skills in a School District: An Examination of Executive Functioning Skills Related to Age, Sex, and Educational Classification. These data are confidential and will not be used for any other purpose. The school district will not be identified in the research.

C. Joyce Nicksick
Superintendent