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P.A.S.S. PROCESSING DIFFERENCES BETWEEN STUDENTS WITH EMOTIONAL DISTURBANCE AND NON-DISTURBED STUDENTS ON THE COGNITIVE ASSESSMENT SYSTEM

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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****

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1998

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ABSTRACT

A study examining the differences in Planning, Attention, Simultaneous, and Successive (PASS) cognitive processes between students identified with emotional disturbance (ED) and non-disturbed regular education students was completed. Archival Cognitive Assessment System scores of 64 students identified with ED were compared with the scores of 64 non-disturbed, regular education students matched by race/ethnicity, age, gender, geographic region, and socio-economic status. Students ranged in age from 5 to 17 years old. ED students were identified by school districts following state and federal guidelines. Control group data was derived from archival records from the Cognitive Assessment System standardization group. Results indicated the two groups, ED and the control, differed significantly on the CAS measures of general intelligence, Planning, and Attention. The ED group had significantly lower Full Scale, Planning, and Attention scale scores than the control group. A discriminant analysis indicated the Planning scale was able to predict which group, ED or non-ED, each subject belonged to with 65.5 percent accuracy. The ED group did not have a significant cognitive weakness. Implications for future research and practical application, including possible interventions related to Planning, was discussed.
DEDICATION

To my grandfather, Steve "Pops" Slezak, who gave of himself to make my life fuller, to my mother, Emily, who showed me how to orchestrate it all, and to my father, Bruce, who taught me to always do a little more.
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v

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CHAPTER 1

INTRODUCTION

Opening Statement

The differentiation, definition and identification of school disabilities, particularly emotional disorders, is unstable and problematic, often because of misinterpretation, stigma, and lack of understanding about the nature of the disability (Forness & Kavale, 2000). Torgesen (1989) noted:

“Differentiation among groups of children having mild disabilities such as learning disabilities, mild mental retardation, or emotional and behavioral disorders has always been problematic. Children functioning around the margin of what might be considered a disability group create special problems in assessment, measurement, and eligibility determination for special education programs.” (pg. 484)

The area of emotional disturbance (ED) is not immune to the vague and ambiguous nature of school related disabilities. The definitions provided in literature are considerably subjective when one attempts to apply them (Kauffman, 2001). Current
special education law includes a definition of ED (IDEA; 20 U.S.C., 1400 et seq.) which was derived from competent research but was not intended to be turned into law (Bowers, 1982). The ED definition may stand out as being the most difficult special education definition to understand. Knoff (2002) indicates that the definition includes vagaries which, "creates, at best, a great potential for inconsistency across referred children, and, at worst, conditions allowing unchecked bias, inequity, and prejudice." (pg. 1288) Further, Knoff notes, the definition permits a, "yes the child qualifies, or no, the child does not." Which does not lead well to intervention or problem solution.

Various models have been described which suggest psychologists take an ecological approach to understanding and identifying with emotionally disturbed children (Bower, 1981, Kauffman, 2000, Knoff, 2002). Approaches include using empirical approaches to evaluate four primary student areas: academic skills, adaptive behavior, social/behavioral skills, and cognitive/metacognitive skills (Knoff, 2002). The focus of this research is on the cognitive area of students with ED and what role cognitive processes play in emotional disturbance.

Cognitive assessment is a mandated part of school evaluation for disability including ED (Daley, Nagle, & Onwuegbuzie, 1997) and may provide an objective approach to help identification. However, cognitive characteristics of children with ED are not frequently examined in the literature. If specific cognitive characteristics were illuminated as part of the ED population, they could provide some objective criteria for the identification and placement issues of these students.
Purpose

The purpose of this study is to determine what, if any, cognitive processes, play a role in emotional disturbance. More specifically, this study seeks to determine if a measure of cognitive processing can differentiate students with ED from regular education students. Knowing if and what cognitive processes play a role in ED could aid the definition and identification of these students by adding more concrete or operational criteria to its description. Further, understanding if students with ED have a specific cognitive weakness, may lead to more precise and thus better intervention with these students.

Multiple Factors in Emotional Disturbance

It would be unwise to suggest that intelligence is the single causal or mediating factor in emotional disturbance. A whole group of etiological factors are cited in relation to emotional disorders, none of which absolutely link but many of which are likely to interact with one another to contribute to emotional disturbance (Kauffman, 2001). Biological factors such as brain injury and biochemical imbalance; environmental factors such as family, divorce, economic conditions; school factors such as socialization, culture, intolerance, and academic exposure are all noted, among others, as likely influences of emotional disturbance (Kauffman, 2001). Intelligence is but one variable which may interact with others and contribute to emotional disturbance. Understanding any unique intellectual processes in students with emotional disturbance may help to add a missing piece to the puzzle of emotional disturbance.
Intelligence factors in Emotional Disturbance

The use of intellectual or cognitive ability is one well established method used to help differentiate various school related disabilities such as learning disabilities and mental retardation (Brinckerhoff, 1995, Gresham, MacMillan, Bocian, 1996, & Shaw, Cullen, McGuire, Jenkinson, 1989). In fact, measures of intellectual ability were initially developed as objective means of differentiating children who would and would not benefit from instruction (Gresham, MacMillan, Siperstein, 1995). Currently, learning disabilities are described, in part, as a dysfunction in one or more basic psychological processes related to intelligence, and are often defined on the basis of a severe discrepancy between intelligence and achievement. Similarly, an individual’s intelligence is a significant factor in the identification and longitudinal classification of mental retardation (Denning, Chamberlain, Polloway, 2000, Gresham, MacMillan, Siperstein, 1995). Cognitive or intellectual deficiencies are regularly cited as part of emotional and behavioral problems (Kauffman, 2001). However, the study of what specific intellectual or cognitive processes may be related to emotional or behavioral disorders in children has received little attention (Stephens, 2000).

Historically, research has connected overall IQ level with dysfunction. However, individuals who appear dysfunctional and are cast as low functioning, actually may have a specific cognitive problem rather than an overall intellectual weakness. Recent intellectual theories indicate that overall intelligence is made up of a group of cognitive processes (Sattler, 1992). These different cognitive processes are engaged to differing
degrees depending on the task at hand and its processing demands (Sattler, 1992). An individual who has a strength in a specific cognitive process may be more likely to succeed on tasks demanding that specific process. Likewise, an individual with a specific cognitive weakness may have difficulty or fail on tasks which demand that cognitive ability. Patterns of specific cognitive abilities, strengths and weaknesses, may be "mapped" or "profiled". These profiles may help us better understand the problems individuals may have. For instance, delinquent adolescents are often described as impulsive and inattentive (Hurt & Naglieri, 1992). Bower (1995) points out that impulsivity, a tendency to act without forethought, to seek instant gratification, to shift attention quickly and to overreact to minor frustrations are closely aligned with criminal behavior. Hurt and Naglieri (1992) found that a sample of delinquent adolescents had a weakness in the cognitive process of attention which reinforces Bower's notion and may indicate a cognitive connection to delinquent behavior. These individuals often score low on commonly used general intelligence tests (Hubble & Groff, 1981). However, the general population includes individuals who have similarly low general I.Q. scores yet do not demonstrate delinquent behavior. It may be the case that more specific factors related to intelligence could be involved in determining how an individual behaves.

Other studies have attempted to uncover specific intellectual patterns in children with emotional disturbance. Morris, Evans, and Pearson (1978) examined the WISC-R subtest profiles of severely emotionally disturbed children. In their study of 113 children ranging in age from 6 to 13, they found no uniquely shaped profile or significant discrepancy between Verbal and Performance abilities. Similarly, Clarizio and Veres (1983) compared a group of emotionally impaired students (n = 64) to a group of controls
Comparison of discrepancy differences for Verbal and Performance scores between groups using a chi-square analysis was utilized. Results did not produce any specific pattern that would differentially identify the emotionally impaired students from controls. Both of these studies did note statistical differences between groups, however these differences did not yield useful information for diagnosis or intervention. The failure of these studies to find specific intellectual patterns is possibly due to the fact that the WISC-R lacks a theoretical or information processing related structure (Reschly & Grimes, 1995; Stephens, 2000). In fact, argueably, the WISC was not initially designed to be evaluated for specific patterns (Kaufman, 1994). Although the WISC tests (WISC-R, WISC-III, and WAIS) yield numerous scores, the most useful scores based on factor analytic investigations and concurrent validity studies are the overall composite scores (Reschly & Grimes, 1995).

Recent cognitive processing theory based intelligence tests may offer the sensitivity to actual cognitive factors that may uncover specific patterns which may exist in children identified with emotional disturbance in schools. Naglieri and Das (1997) have developed an instrument, the Cognitive Assessment System (CAS) to assess the four theoretical cognitive processing areas: planning, attention, simultaneous, and successive (PASS) as well as general intelligence. Using the CAS provides a general IQ (The Full Scale I.Q.) score but also four similar I.Q. like scale scores for each of the four PASS areas. The Planning Scale reflects ability with determining, selecting, applying, and evaluating solutions to problems. This includes the 1) selection of relevant information in the task, 2) selection of relevant prior knowledge, 3) initiation of a "way" or strategy to approach a task, 4) monitoring progress, and 5) developing new strategies.
when necessary. The Attention Scale indicates ability in focusing on one stimulus at a
time, resisting distractions, sustaining effort over time, paying selective attention to one
thing to the exclusion of others and maintaining focus over time. The Simultaneous
Scale reflects ability in cognitively relating parts into a comprehensive whole, seeing how
things fit together, understanding relationships among words, figures or ideas, working
with spatial relationships, seeing several things at one time and integrating words into
larger ideas. The Successive scale reflects working with things in specific order
(ordering sounds or words), understanding facts based on order, perceiving stimuli in a
sequence, executing movements in order, remembering and holding sounds or words in
sequences, or retaining sequences of events from text and serial organization of speech.

The information provided by the CAS not only shows how an individual functions
cognitively but it may provide a link to how intervention should be focused relative to an
individual’s cognitive strengths and weaknesses. Knowing a specific populations’
cognitive strengths and weaknesses or profile may provide better understanding of that
population including better diagnoses and intervention if the population’s profile is
distinct from other populations.

Recent studies

Naglieri (1999) has indicated that certain clinical populations (attention deficit
disorders, traumatic brain injury, reading disabilities) may yield distinct cognitive
profiles. For example, one study (Naglieri & Das, 1997) compared the cognitive profiles
of children with ADHD to the profiles of children with a reading disability. Results
comparing PASS scores between groups showed that the ADHD group earned means lower on Planning and Attention than the reading disability group.

Hurt and Naglieri (1992) compared the cognitive profiles of delinquent adolescents to normal adolescents. 30 white adolescent males, mean age of 15 years, 8 months (SD = 7 months) were matched to 30 adjudicated adolescent, white males, mean age 15 years, 8 months, (SD = 7 months). The delinquent males had been incarcerated for property offenses (e.g., larceny, burglary, vandalism, auto theft, stolen property). Subjects were matched on the basis of age, sex, geographic region, race and socioeconomic status. Both groups were administered measures (pre-standardization CAS sub-tests) of the four PASS scales. Results showed that the delinquent group did not show any significant differences from the non-delinquent group on measures of planning, simultaneous or successive processing. The delinquent group did show a significant difference on the measure of attentional processing. Although this study includes delinquents rather than those identified with emotional disturbance in school, it does provide an early parallel to the study being proposed here. Hurt and Naglieri concluded that specific deficiencies in the PASS processes may provide a useful perspective of a group’s cognitive competence.

Another study investigating specific PASS processes was undertaken recently by Stephens (2000). Stephens studied the relationships between PASS cognitive processes and problem behavior in school children referred for special education (n = 182). PASS processes were measured using the Cognitive Assessment System (CAS), and measurement of problem behaviors was obtained from Achenbach Teacher Report Form (TRF) scores. Correlational and profile analyses were conducted to test two
hypotheses: 1) subjects with high scores on measures of externalizing behavior would have low scores on cognitive measures of Planning and/or Attention, and 2) subjects with high scores on measures of internalizing behavior would have low scores on measures of cognitive Planning. Partial support for the first hypothesis was gained from findings that subjects with high TRF Inattentive Syndrome and Externalizing Composite Scale scores also manifested cognitive processing problems, reflected in their CAS Planning and Attention scores. However, statistically significant relationships between CAS Planning or Attention and the TRF Aggressive Scale were not found. The second hypothesis was supported by findings that subjects with high TRF Internalizing Composite scores also manifested cognitive processing problems in CAS Planning, but Planning was not significantly associated with TRF Anxious or Social Withdrawal Syndrome Scale scores. Relationships between TRF internalizing scales and CAS Attention, Simultaneous, and Successive scales were found to be significant, indicating that internalizing problems are potentially associated with a wider range of cognitive processing difficulties than had previously been reported. The TRF Unpopular and Self-Destructive Syndrome Scales, which have been described as measures of a mix of internalizing and externalizing behaviors, were also found to be significantly associated with CAS Planning and Attention. These findings suggest there is a link between specific cognitive processes, as measured by the CAS, and problem behavior. A limitation of this study is that no control or comparison group was used to determine the uniqueness of the results as the findings could be related to group selection (special education referral) rather than problem behaviors.

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A study similar to the one proposed here was described by Daley, Nagle, and Onwuegbuzie (1997). This study used the 1994 CAS standardization edition (which included 14 separate subtests and yielded PASS scale scores), to compare the cognitive profiles of 40 children identified with serious emotional disturbance to a control sample of 40 regular education students. The two groups were matched according to age, race, and sex. Devereux Behavior Rating Scales were also collected for the 40 students with emotional disturbance to determine if the group was diverse relative to presenting behavior problems. A series of independent t-tests and discriminant analysis was conducted to determine if the students with emotional disturbance group differed significantly from the regular education group. Results indicated that the groups differed significantly across all four PASS scales. Further, results indicated that the two areas of Planning and Simultaneous processing were a particular deficiency for the emotionally disordered group. This study emphasizes the possibility of specific cognitive profiles or strengths and weaknesses in students identified with emotional disturbance. The standardization edition of the CAS included 2 subtests which are not included on the current CAS as well as variations of CAS subtest which were not included after standardization. Thus, unproven scoring and sample based means were used for the inter- and intra- group comparisons of this study. Further, sample group size was minimal at 40 and was only matched by age, race, and gender. Also, the test’s 14 subtests take a considerably longer time to administer than the current CAS and may have introduced the variable of fatigue to the testing situation.
The following study intends to build on this line of research. By comparing an ED group with a non-ED the following study seeks to improve the empirical investigation of cognitive processes in students with emotional disturbance.

**Proposed Study**

This study is designed to compare the performance of students with ED to regular education students on a measure of cognitive ability in order to determine if specific cognitive factors play a role in differentiating the two groups. Two groups of students, one group identified with emotional disturbance by federal and state guidelines, and one group of non-disturbed, regular education students will be individually matched by race, age, and socioeconomic status and compared using the Cognitive Assessment System (CAS). The CAS gives an overall Full Scale IQ score as well as the four cognitive scales, Planning, Attention, Simultaneous and Successive processing (PASS). These scales can be compared as to overall cognitive differences as well as specific cognitive area differences. Any differences discovered may provide insight into specific areas of cognitive functioning that may be different for disordered and non-disordered children. Additional factors explored include differences in demographics.

The research questions to be answered are as follows:

1) Do the two groups, ED and the control, differ significantly on the CAS measure of general intelligence (Full Scale score)?

2) Do the two groups, ED and the control, have significantly different PASS scores?
3) Do one or more specific PASS scales predict which group a student belongs to?

4) Does the ED group overall have significant cognitive weaknesses?

Audience

Most educators realize the importance of identifying characteristics of human nature which affect students' behavior (Perna, Dunlap, and Dillard, 1983). Practitioners such as school psychologists, school policymakers, and researchers interested in factors related to emotional disorders are likely to find this study enlightening and possibly useful. Knowing a student’s or student population’s cognitive weakness has led to more specific and better intervention in some recent studies (Naglieri & Gottling, 1995).

Thus, if this study is able to provide more information as to the cognitive uniqueness of students identified with emotional disturbance, it may help to better determine identification, placement, and instruction. Moreover, knowing any unique cognitive make-up of students with emotional disturbance is likely to help direct and focus future research.

Definition of Terms

Emotional disturbance. This term refers to children who have been diagnosed or display characteristics of emotional or behavioral disturbance which results in academic difficulty or failure and identification by school or other like entity.

The term has evolved and has included terms such as severe behavioral handicap (SBH), severe emotional disturbance (SED), and emotional disturbance (ED).
Current IDEA legislation uses the term ED but SED terminology is still often used in practice. For this study, ED is defined using IDEA guidelines (IDEA; 20 U.S.C., 1400 et seg.):

(i) The term means a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree, which adversely affects educational performance:

(A) An inability to learn which cannot be explained by intellectual, sensory, or health factors;

(B) An inability to build or maintain satisfactory interpersonal relationships with peers and teachers;

(C) Inappropriate types of behavior or feelings under normal circumstances;

(D) A general, pervasive mood of unhappiness or depression; or

(E) A tendency to develop physical symptoms or fears associated with personal or school problems.

(ii) The term includes children who are schizophrenic. The term does not include children who are socially maladjusted, unless it is determined that they are seriously emotionally disturbed. (45 C.F.R. 121a.5[b] [8] [1978])

I.Q. (intelligence quotient). This term refers to a standard score derived from a measure of intellectual ability.

Intelligence. Intelligence refers to a person’s general mental ability.
Cognition (cognitive). This term refers to a person’s mental ability from an information processing perspective in which mental activity is conceptualized as made of specific parts or processes which function together.
CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter summarizes law and the research studies of cognitive ability in children with emotional or behavioral disorders. A brief history and description of intelligence and cognitive processes including the PASS theory, will also be described. Finally the identification and terminology of emotional or behavioral disorders in school children will be discussed.

Definition and Identification of Emotional Disturbance

Law

Federal law has adopted the term emotional disturbance (ED) to label students with emotional and behavioral problems. This term used to describe this particular school related disorder has undergone some evolution. Earlier labels used include behavior disorder, serious emotional disturbance, and severe behavior handicap (Duncan, Forness & Hartsough, 1995). The current federal definition of emotional disturbance which has been adopted by the state of Ohio is as follows:
(iii) The term means a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree, which adversely affects educational performance:

(A) An inability to learn which cannot be explained by intellectual, sensory, or health factors;

(B) An inability to build or maintain satisfactory interpersonal relationships with peers and teachers;

(C) Inappropriate types of behavior or feelings under normal circumstances;

(D) A general, pervasive mood of unhappiness or depression; or

(E) A tendency to develop physical symptoms or fears associated with personal or school problems.

(iv) The term includes children who are schizophrenic. The term does not include children who are socially maladjusted, unless it is determined that they are seriously emotionally disturbed. (45 C.F.R. 121a.5[b] [8] [1978])

Eligibility determination is done by a multidisciplinary team who evaluates the above criteria based on a multifactored psychoeducational evaluation. The multidisciplinary team includes teachers, psychologists, parents, school administrative personnel, and any other professional with pertinent information. The multifactored evaluation involves collecting data and information from multiple sources including observations, records, and interviews, and requires testing data including intelligence tests.
This definition is taken almost word for word from Bowers's 1960 study in which he surveyed and described common characteristics of 207 emotionally disturbed students (Bowers, 1982). Bowers has noted that the results of his study were not intended to be developed into public policy and that the definition is contradictory in intent and content to the research from which it came. He explains defining emotional disturbance is a slippery task and that, as with many human conditions that defy definition, more research and understanding is needed. Bowers and others (Kauffman, 1999, Knoff, 2002, Smith, et al, 1985) call for more research to understand emotional disorders and shy away from any set definition of them. In fact, Bowers (1982) has noted that the current definition does not effectively operationalize ED, that is does not provide a link to treating ED students, and that it may miss students with significant problems, doing more damage than good. Knoff (2002) essentially concurs, indicating that current practice tends to identify students with externalizing, behavioral problems, missing students who do not act out yet have considerable disability. Often students are identified because of the behavioral problem they pose the teachers in the classroom, rather than actual emotional disability.

Research

Kauffman (2001) states, “an emotional disorder is whatever behavior a culture’s chosen authority figures designate as intolerable. Typically, it is behavior that is perceived to threaten the stability, security, or values of that society” (pg. 23). This statement helps illustrate the subjectivity in defining emotional disorders. Many studies have noticeably different procedures for the identification and description of subjects.
with emotional or behavioral problems. Bortner and Birch (1968) used the following for emotionally disturbed criteria: a) must show learning disability, b) have an I.Q. above 50, c) not profit from classroom experience, d) psychiatric diagnosis may include autism, schizophrenia, aggression, and hostile and hyperactive behavior, and e) have disruptive, withdrawn and classroom management problems. Motto and Wilkins (1968) based their classification of emotional disturbance on clinical diagnosis including brain damage, schizophrenia, maladjusted reactions of adolescence, attentionlessness, psychoneurosis, and psychosis. Motto and Wilkins' (1968) group of emotionally disturbed students were identified by their acceptance in psychoeducational programs in the state of Georgia which was based on psychological testing and assessment of behavior deviations by a standardized checklist. Clarizo and Veres (1983) used state of Michigan definitions and emotional disturbance special education placement to identify their sample. Stephens (2000) used the Achenbach Child Behavior Checklist to identify specific problem behaviors.

The use of special education placement to identify a sample of students with emotional disturbance has been enlisted by various studies. Kauffman et al. (1987) used state guidelines to identify a sample of subjects with emotional disturbance. Stephens et al. (1990) used students who were identified by a multidisciplinary team which applied state criteria for emotional disturbance. Similarly, Daley et al. (1997) used subjects identified by a multidisciplinary team using data based on a multifactored psychoeducational assessment. Using special education placement has its problems. Most notably, identification relies on the subjective application of somewhat vague legal definitions which may differ from state to state (Kauffman, 2001, Stephens, 2000).
subjective approach may lead to conflicting or confusing study results (Stephens, 2000). Considering the current disagreement on conceptual models, the differing definitions, and variability of deviant behavior (Kauffman, 2001), it is likely that the subjective nature and variability of ED identification may be difficult to avoid. Kauffman (2001) notes that subjectivity in the identification of emotional disturbance is unavoidable and necessary due to the nature of the disability and current research. Using special education placement to identify a population with emotional disturbance appears to be a reasonable approach and one which is most consistent with related studies.

Intelligence and Disability

The idea of identifying and evaluating the intellectual factors of children with educational, emotional and behavioral problems has existed for years. As early as 1838 a philosopher and scientist named Jean Esquirol’s innovative work attempted to distinguish between mental retardation and emotional disturbance using intelligence. Esquirol believed language use was the best criterion for measuring intelligence and used labels for levels of mental retardation including “moron”, “imbecile”, and “idiot” to classify children (Kaufman, 2000). In 1907 Edward Seguin evaluated the abilities of mentally retarded individuals with the eventual goal of educating them. Seguin’s work was a strong influence in the early 1900s for Maria Montessori whose educational approach is still utilized today. Even though research on intelligence was in its infancy and lacked a well formed conceptualization, these researchers saw value in measuring intellectual ability.
The notion of intelligence, is still not solidly understood or agreed upon, but has become accepted as a concept. One study summed up the basic description of intelligence given by over 1,000 experts in the field of psychology as: abstract thinking or reasoning, the capacity to acquire knowledge, problem solving ability, and adaptation to one’s environment (Snyderman and Rothman, 1987). Kaufman (2000) describes intelligence as a student’s learning in general skill areas. The broad notion of intelligence is that individuals have a general ability to interact with their environment that varies from person to person and can be measured. This metric is referred to as an intelligence quotient (I.Q.).

Alfred Binet, the developer of the first “real” intelligence test conceptualized intelligence as one’s ability to demonstrate memory, judgment, reasoning, and social comprehension. Binet’s original test, which evolved into the Stanford-Binet Intelligence scale and is still used today, involved tasks which were primarily verbal in nature to measure intelligence. In 1905 Binet developed the Stanford-Binet Intelligence Test to screen school children (Sattler, 1992). World War I brought a need for evaluating the intellectual ability of new recruits (Sattler, 1992). For this, the Stanford-Binet test was converted to a group administration format and called the Army Alpha test. The Army Alpha test proved useful but because of its verbal nature it penalized the many immigrants in the United States with limited English. This led to the birth of intelligence measures which were nonverbal in nature (Kaufman, 2000). Continued test development has led to a variety of verbal, nonverbal, and combined verbal/nonverbal tests many with 8 to 14 scaled scores on separate subtests. The commonly used Wechsler Intelligence Scale for Children, WISC, for example, was derived from the Army Alpha test and yields
an overall Full Scale I.Q. score, Verbal I.Q. and Performance I.Q. scores, as well as 14 subtests which yield standard scores.

One reason for the extensive use of intelligence tests in schools is that they have been shown to be significantly correlated with achievement and related to the acquisition of knowledge (Kaufman, 2000, Naglieri, 1999, Sattler, 1992). The assumption is that a person with a given IQ will reach a similar level of performance or academic achievement. Hence, scores have been used, albeit inappropriately at times, to group, classify, select, and discriminate between children for various reasons.

Psychological research regularly uses IQ as a descriptive factor of specific clinical populations. Individuals may be classified by their IQ or by referencing their IQ in conjunction with other factors. For instance, current definitions of mental retardation rely heavily on I.Q. scores for identification. Mental retardation is typically described as significantly subaverage intellectual ability, often defined by an I.Q. score below 75, as well as significantly "limited" adaptive skill areas (Gresham et al., 1995). Some dissent and problems exist with the use of I.Q. scores for diagnosis including reliability, validity, definition of intelligence, and variability in measurement (Gresham et al. 1995). However, current I.Q. tests do appear to be the best descriptor of intellectual ability and a good predictor of educational achievement (Reschly & Grimes, 1995).

Definitions of learning disability (LD) typically include reference to intellectual or cognitive functioning (Shaw, Cullen, McGuire, Brinkerhoff, 1995). The assertion is that the disorders involved with learning disabilities are due to central nervous system dysfunction which may be detectable through intellectual measures (Shaw et al. 1995, Torgesen, 1989). LD is typically defined on the basis of a severe discrepancy between an
ability score (I.Q.) and achievement scores in which achievement is significantly lower than measured I.Q. Although there is considerable disagreement as to the definition of learning disabilities as well as the use of intelligence tests to identify them (Stanovich, 1989, Torgessen, 1989) support does exist for using intelligence measures to identify learning disabilities (Torgessen, 1989, Naglieri, 2002). This support references IDEA '97 legislation that a learning disability, "means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, read, write, spell, or do mathematical calculations" (pg. 27). The idea presented is that weaknesses in certain intellectual abilities (ie. basic psychological processes) may manifest in difficulties listening, thinking, reading, writing, spelling, or mathematics.

Investigation into factors involved in children with learning disabilities is growing. Gresham, MacMillan, and Bocian (1996) compared cognitive, achievement, social skills, problem behaviors, perceptual motor, and school information (days absent, retention, discipline, etc.) factors of children identified with learning disabilities (LD), low achievement (LA) and mild mental retardation (MMR). The results demonstrated significant differences between the three groups on cognitive factors (WISC-III Full Scale I.Q., Verbal I.Q. and Performance I.Q.) and measures of achievement. Some groups were not able to be differentiated on measures of social competence, problem behavior, or school history. Gresham et al. concluded that their investigation suggests that the LD and LA groups, the LD and MMR groups, and the LA and MMR groups could be reliably differentiated using measures of intellectual ability and tested academic achievement. Studies of this nature provide some interesting information regarding...
differentiation among children with learning problems. The differences found however, may be due to the way in which the groups are defined. Since, some differentiation of school disability categories has been found using intelligence tests, the question, if a similar differentiation is possible with students identified as emotionally or behaviorally disturbed, is worth asking.

Germane to this study, research often describes individuals demonstrating antisocial or problematic social and emotional behavior such as delinquents and those with emotional or behavioral disorders as having I.Q. scores significantly below the population average (Kauffman, 2001). David Wechsler, creator of possibly the most widely used IQ scales in the world, maintained that IQ is a fundamental aspect of personality and should be used clinically (Kaufman, 2000). One study demonstrated that the IQ deficits of delinquents were significant even after controlling for the effects of race, socioeconomic status, and test motivation (Henry, et.al. 1999). At the same time, youngsters being raised by abusive, unstable parents or living in crime-ridden neighborhoods that nevertheless refrain from delinquency often have above average IQ (Bower, 1995). It does appear that IQ, or something related to IQ, contributes to an individual’s behavior and classification in certain psychological or behavioral categories be it gifted, normal, mentally retarded or emotionally or behaviorally disturbed. It may even be suggested that individuals formerly identified as having social or emotional problems and having lower IQ may in fact demonstrate average ability in specific areas yet deficiencies in others (see Hurt & Naglieri, 1992 for an example).
Intelligence and Emotional Disturbance

Research has often indicated that students with emotional or behavioral disorders tend to have lower than normal IQ (Kauffman, 2001). An early analysis of intellectual ability in emotionally disturbed and brain damaged children was presented by Bortner and Birch (1968). Bortner and Birch stated that the effective management of children with learning problems relies on the identification of underlying psychological functioning. They studied 247 children, 131 designated with emotional disturbance and 116 designated as brain damaged, all aged 7 to 11. The mean WISC Full Scale I.Q. for the group with emotional disturbance was 88.1 (SD = 20.1, range not reported). For the brain damaged group, the mean WISC Full Scale I.Q. score was 77.0 (SD = 11.9, range not reported). For both groups, Verbal IQ to Performance IQ subtest differences were not statistically significant. Bortner and Birch concluded that although students designated emotional disturbance have higher I.Q.s than brain damaged students, they do not exhibit any differences in patterns on WISC subtests than brain damaged students and thus may have brain damage as well. Their conclusion, although somewhat bold considering the limited variables studied, is an early presentation of the notion that specific groups of children may differ from one another in certain aspects of intellectual composition.

Kauffman, Cullinan and Epstein (1987) studied the records of 249 students, aged 7 to 19, who were identified by appropriate federal, state, and local regulations as seriously emotionally disturbed (SED). WISC-R Full Scale I.Q. scores were available for 142 of the 249 students. The average I.Q. score for the 142 students was 91.2 (SD = 14.6, range = 43-133). In that group, one score was above 130 and seven where below 70. They also collected data regarding educational placement, achievement levels, and
specific problem behaviors. Within their study, Kauffman et al. found that as a whole, intelligence was related to educational placement. In other words, brighter SED students were likely to be placed for a greater amount of the day in regular classes than SED students with lower ability. Kauffman et al. noted that children with emotional disturbance as a group tend to have less than average intellectual ability and achievement. They expressed surprise that they did not find a significant relationship between I.Q. and any behavior problem factor. One criticism that may be leveled at this study is that it did not make correlations or comparisons using I.Q. scores other than the general Full Scale I.Q. score.

Duncan, Forness, and Hartsough (1995) analyzed the diagnostic profiles of 85 students identified as SED in school based day treatment programs. Archival records showed a mean I.Q. of 94.0 (SD = 14.6, range not reported) for the group. Mean Wechsler (WISC-R, WISC-III, WPPSI-R, or WAIS-R) Verbal and Performance IQ scores were within 2 standard score points of each other and not significant. I.Q. scores did not correlate with any other measures Duncan et al. collected including demographics, Diagnostic and Statistical Manual (DSM) diagnosis (Conduct Disorder, ADHD, Depression, Schizophrenia, or Post-traumatic Stress Disorder), and life events.

Another early study by Motto and Wilkins (1968) analyzed the general intelligence and educational achievement of 48 children with emotional disturbance in a state mental hospital. WISC results of the children, age 8 to 17, 11 females and 33 males, showed a mean Full Scale ability score of 94 (range 72-136, no SD reported), with mean Verbal I.Q. score of 90 and Performance I.Q. score of 98. The Verbal-Performance I.Q. difference was significant at the .01 level, with Performance I.Q. scores being higher.
Motto and Wilkins stated that, "The educational implications of this intelligence patterning are obvious." (pg.218) Whether the educational implications are "obvious" or not, it is apparent that the researchers were looking beyond a general I.Q. score for insight into the functioning of children with emotional disturbance.

A problem with many of these studies is the use of one intellectual test, the Wechsler Intelligence Scale for Children (WISC). These studies and others may have missed significant differences due to the lack of theory based constructs and accuracy in Wechsler intelligence measures (Reschley & Grimes, 1995). Wechsler tests may be limited in their overall ability to detect specific cognitive differences, especially considering the more sophisticated intellectual instruments which are available (Kauffman, 1976, Naglieri, 2000).

The WISC (now the WISC-III) is one of the widest used intelligence tests in school settings (Reschly & Grimes, 1995). One criticism of the WISC-III is that it is atheoretical and does not provide useful information beyond the Full Scale I.Q. score (Naglieri, 1999, Reschley & Grimes, 1995). Comparing WISC Performance I.Q. and Verbal I.Q. discrepancies, as well as subtest standard scores to one another has been suggested to provide a more detailed understanding of an individual (Sattler, 1992). Comparing WISC-III subscores can be commonly found in the literature (see Duncan, Forness, & Hartsough, 1995, Hubble & Groff, 1981, and Stephens, Clark & Kaplan, 1990 for examples). This practice however, has limited empirical support and minimal theoretical support (Kauffman, 1976, Reschly & Grimes, 1995). Caspi and Moffitt (1995) have suggested the PIQ>VIQ discrepancy is evidence that delinquent children may have specific deficits in language use. However, describing and using the WISC
Verbal I.Q. as a measure of language is a questionable practice (e.g. Enns, 1998; Hurt & Naglieri, 1992). Kaufman (1976) notes that Performance I.Q. versus Verbal I.Q. discrepancies were common in the WISC-R standardization sample, are not novel and thus should not be considered for differential diagnosis. The subscales and subtests of the WISC-III were not designed to reference specific intellectual or cognitive theory (Reschly & Grimes, 1995, Naglieri, 1999) beyond that of general intelligence. Thus, interpreting the WISC-III subscales as meaningful is not warranted.

Cognitive Processes

Intelligence has more recently been conceptualized from an information-processing perspective. The information-processing perspective conceptualizes intelligence as being comprised of varied mental or cognitive processes. These specific cognitive processes operate on and transform the information or stimulus a person receives prior to the individual's response (Sattler, 1992). The information processing perspective does not necessarily do away with the notion of general intelligence, it just indicates there are more specific cognitive processes that make up intelligence. Many of the information processing models take their language and conceptualization from computer technology (e.g. information processing) and base their structures on neuropsychological principles (Obrzut & Hynd, 1983, Naglieri & Prewett 1990, Sattler, 1992). Recent test development such as the Kaufman Assessment Battery for Children (1984), the Cognitive Assessment System (1997), The Woodcock Johnson III Tests of Cognitive Ability (2001) as well as others, have attempted to incorporate cognitive processing theories into intellectual testing.
Recent theories of cognitive functioning have been built on specific brain functions, which has lead investigation to areas of neuropsychology (Gaddes, 1983, Naglieri, 1999). Some recent theory based intelligence tests relate to neurological models (Reschly & Grimes, 1995). Stephens, Clark, and Kaplan (1990) investigated the association between neuropsychological impairment and psychiatric disorders in school children. Specifically, they investigated the neuropsychological performance of 65 students with emotional disturbance identified and served in public schools using the Luria-Nebraska Neuropsychological Battery (LNNB) and the Luria-Nebraska Neuropsychological Battery: Children’s Revision (LNNB-C). WISC-R scores were also attained from records for comparison. The students were split into two groups; a younger group comprised of 33 students aged 99 to 154 months (approximately 8 years to 12 years), and an older group comprised of 32 students aged 156 to 226 months (approximately 13 years to 18 years). Records showed on the WISC-R the younger group had a mean Full Scale score of 83.8 (SD = 13.9, range not reported) and the older group had a mean Full Scale score of 87.1 (SD = 19.1, range not reported). The younger group had a mean Verbal I.Q. score of 87.5 (SD = 16.8, range not reported) and a mean Performance I.Q. score of 84.3 (SD = 15.5, range not reported). The older group had similar scores, mean Verbal I.Q. of 90.7 (SD = 18.7, range not reported) and mean Performance I.Q. of 87.9 (SD = 19.1, range not reported). The LNND-C and LNNB are comprised of 14 scales including: Motor Functions, Rhythm, Tactile Functions, Visual Functions, Receptive Speech, Expressive Speech, Writing, Reading, Arithmetic, Memory, Intellectual Processes, Pathognomonic, Left Sensorimotor, and Right Sensorimotor. Results indicated that on 10 of the 14 scales, differences between the
students with emotional disturbance and the standardization sample were significant. Students with emotional disturbance’s performance on the scales that involved more complex cognitive tasks such as Writing and Intellectual Processes, tended to be significantly worse than performance on less complex, sensory-motor tasks such as Tactile Functions or Motor Functions. Correlations between each of the 14 LNNB/-C scale means and the WISC-R Verbal, Performance and Full Scale I.Q. means tended to be moderately high (-.26 to -.86). The notion extended here, not unlike the Verbal-Performance comparisons in Bortner and Birch’s and Motto and Wilkins’ studies, is that more specific factors related to cognitive processes may better explain students with emotional disturbance than simply low intelligence.

PASS Theory

Although the WISC-III remains the test of choice for school and clinical psychologists (Kaufman, 2000) intelligence test development has progressed in the last two decades. Many intelligence tests developed in the 1990s have deliberately based their scores on cognitive and neuropsychological theoretical constructs. These tests such as the Kaufman Adolescent and Adult Intelligence Test (Kaufman & Kaufman, 1993), the Cognitive Assessment System (Naglieri & Das, 1997) and the Woodcock-Johnson III Tests of Cognitive Ability (Woodcock, McGrew, & Mather, 2001) seek to refine the notion of intelligence, including connecting it closely to theory based in neuropsychology and learning and memory theories as well as clearly delineating intelligence from achievement (Flanagan & Oritz, 2001).
Naglieri and Das (1997) have presented a cognitive perspective of intelligence, based on the neuropsychological, information processing, and cognitive psychological research of A.R. Luria (Naglieri, 1999). They have analyzed Luria’s work and come up with a four part framework that includes Planning, Attention, Simultaneous and Successive processes or PASS. This perspective proposes that these four processes are the basic building blocks of intellectual functioning. These different processes, although distinct, work together interdependently being “involved in activity and interacting with the person’s fund for knowledge.” (Naglieri, 1999, pg.21) Using this framework may serve to ascertain the cognitive origins of many phenomenon which have been previously described in terms of broader general intelligence.

The Cognitive Assessment System was developed based on the PASS theory (Naglieri & Das, 1997). It is an individually administered test for children ages 5 through 17 years. It is comprised of 12 subtests and generates a Full Scale I.Q. score as well as four scale scores reflecting the four PASS processes. Each scale is expressed as a standard score with a mean of 100 and standard deviation of 15. The test was standardized with 2,200 children ages 5 years, 0 month to 17 years, 11 months, who closely match the U.S. population on the basis of gender, race, region, community setting, classroom placement, educational classification and parental education. The average internal reliabilities for the PASS scales for the standardization sample were: Planning = .88; Simultaneous = .93; Attention = .88; Successive = .93; and Full Scale = .96 (Naglieri, 1997).
Naglieri (1999) has suggested certain child clinical populations (ADHD, TBI, reading disabled) who tend to manifest academic difficulties and often behavioral problems may yield distinct cognitive profiles. Naglieri and Das (1997) compared the cognitive profiles of children with ADHD to the profiles of children with a reading disability. Results showed that the ADHD group had a significantly different pattern or cognitive profile than the reading disability. Specifically, the ADHD group was significantly low in Planning and Attention with average to above average Simultaneous scores, and the reading disability group showed overall low average performance and low Successive scores. This finding is in sharp contrast to a study in which the WISC-III was used to compare three groups of students: a group with learning disabilities, a group with ADHD, and a group with a reading disability. The results of this study indicated that the WISC-III subtest profile of each of the groups were essentially the same. These studies, highlight the notion that using the CAS, which measures specific cognitive processes with a strong theoretical connection, yields profiles which differentiate one group from another. Conversely, a traditional measure such as the WISC-III fails to differentiate between similar types of groups. This suggests that the CAS may provide a more useful perspective from which to diagnose and view children with different problems than traditional measures such as the WISC-III.

Recently criticism has been levied that intelligence tests are biased against minorities and that this leads to over identification of minorities as disabled (Kush et al., 2001). The notion is that variations in cultural norms embedded in tests or testing situations may influence measurement of intellectual ability unfairly (National Research Council, NRC, 2002). The argument has been made that the content, structure, language,
or format of standardized tests tends to be biased for mainstream, middle- or upper-class backgrounds. This has led to legal plans to limit or ban the use of IQ tests in placement in some areas (NRC, 2002). Although research has not determined that IQ is to blame, some minorities are found to be represented in disability categories at a greater rate than they are in the general population (Patton, 1998). In fact recent reports indicate that nationally, black students are represented in the ED category in a proportion greater than the general population of school age black students (22nd ARC, 2001). It is important to note however, that the current federal definition of ED requires an evaluation that includes an IQ test but no specific IQ values are given.

The National Research Council (2002) has noted the ongoing debate and multiple problems that can be associated with IQ tests but pointed out that no evidence for test bias exists. The NRC did point out that although bias is not apparent, they do not appear to be related to effective intervention.

The CAS has been described as culturally unbiased and may provide additional advantage over other traditional measures of intelligence in reducing disproportional identification. Research using newer cognitive measures of intelligence such as the CAS that are not culturally influenced could prove valuable if a certain utility of the measures emerges.

Summary and Conclusion

Intellectual ability has been related to various school based disabilities. I.Q. scores are used in eligibility determination for disability categories such as LD and mental retardation. Intelligence factors have been noted in students with ED. Many
studies have indicated ED students have a lower mean general intelligence level than the
typical population. Further, some studies have indicated that ED students may have a
specific cognitive weakness or weaknesses. Some studies have used Wechsler
intelligence tests to investigate specific areas of cognitive weakness in ED students.
Results have been inconsistent, possibly due to the questionable validity of using
Wechsler tests for subtest profiling. Recent cognitive theory based measures of
intelligence may offer more valid measurement of specific cognitive abilities. The CAS
is one such measure based on the four cognitive process, PASS model. Preliminary
research has demonstrated that the CAS does demonstrate differentiation between some
disabled groups.

The use of the federal legal definition and procedures for the identification of ED
students is a reasonable way to select ED groups for study. Even though this method is
imperfect in its subjective nature, it follows the procedures schools currently use for
identification and thus is consistent with practice. Using the common method for
identifying these types of students and pairing it with new technology in measuring
cognitive abilities may provide information to better understand this type of student.

Using the CAS to compare ED students with regular education students appears to
be a modern and reasonable approach to determine the cognitive nature of ED. Research
on objective factors in ED such as cognitive ability is sparse but may be important to the
field.
CHAPTER 3

METHODOLOGY

Subjects

A purposive sample including two groups of subjects, a group with emotional disturbance (ED) and a regular education (non-ED) control group, was selected and compared using CAS scores. A convenience sample was used for the ED group and included students age 6 to 17 who had been identified as ED in accordance with federal and state laws for emotional disturbance. These students were selected and matched by age, gender, race, socio-economic status (SES), and geographic region, to a student for comparison from the control group. These demographics are the same as used in the CAS standardization sample. To select subjects, lists of ED students were gathered from each of the participating school districts. From these lists, ED students’ CAS scores, age, gender, race, and SES were collected from student files. The minimum total ED group consisted of 64 school age students. This sample size was selected based on similar studies (Hurt & Naglieri, 1992, Daley, et al. 1997), subject availability, and desired experimental power. The power of an experiment is controlled by the interaction of the experiment’s significance level, the magnitude or size of treatment effects and sample size (Keppel, 1991). Keppel (1991) states, “…methodologists are beginning to
agree that a power of about .80 represents a reasonable and realistic value for research in the behavioral sciences. A power of .80 is reasonable in the sense that it reflects a presumed general sentiment among researchers that type I errors are more serious than type II errors and that a 4:1 ratio of type II to type I error is probably appropriate.” (pg. 75). A sample of 62 students, with a medium effect size of 0.06 (Stevens, 1995) and alpha set at .05, results in a power of .80 (Stevens, 1995, table page 585).

The control group was comprised of a sample matched to the ED group and were selected from nondisabled students in the standardization sample of the CAS. The standardization sample of the CAS is composed of 2,200 children ranging in age from 5 years 0 months to 17 years 30 days, both male and female, including black, white, native American, and Hispanic ethnicities or races, from regions of the entire United States (divided as Midwest, Northeast, South, and West), d ranging from low to high socio-economic status (determined by parental educational level).

Procedures for identification of the ED population were as dictated by the state and federal government which mandates a multi-professional team to determine identification and includes a multifactored assessment including measures of intelligence, academic achievement, social-emotional functioning, medical screening, vision and hearing assessment and multiple observations

**Independent Variable**

The independent variable in this study is school disability classification, i.e. students with emotional disturbance (ED) or, non-emotionally disturbed (non-ED), regular education. The ED subjects are determined to be eligible for special education
services under the identification of emotional disturbance. The federal definition for
identification of emotional disturbance which has been adopted by the State of Ohio, is as
follows:

(v) The term means a condition exhibiting one or more of the following
characteristics over a long period of time and to a marked degree, which
adversely affects educational performance:

(A) An inability to learn which cannot be explained by intellectual,
sensory, or health factors;

(B) An inability to build or maintain satisfactory interpersonal
relationships with peers and teachers;

(C) Inappropriate types of behavior or feelings under normal
circumstances;

(D) A general, pervasive mood of unhappiness or depression; or

(E) A tendency to develop physical symptoms or fears associated with
personal or school problems.

(vi) The term includes children who are schizophrenic (or autistic). The term
does not include children who are socially maladjusted, unless it is
determined that they are seriously emotionally disturbed. (45 C.F.R.
121a.5[b] [8] [1978])
Eligibility is determined using the above definition by a team consisting of the students' parents, teacher, special education teacher, a district representative and a person capable of interpreting the results of the psycho-educational evaluation. Included in initial placement is a multifactored evaluation which includes but is not limited to:

1) Physical examination completed by a licensed doctor of medicine or doctor of osteopathy;

2) Vision, hearing, and motor abilities;

3) Communicative status;

4) General intelligence as determined through a measure of cognitive functioning administered by a qualified psychologist using a test designed for individual administration;

5) Academic performance;

6) Background information including educational, family, and medical history;

7) Informal behavioral observation by the child's current teacher and at least one other team member; and

8) Behavior or personality measure.
Dependent Variable

The dependent variable in this study is CAS Basic Battery Full Scale score and scale score on each of the four PASS cognitive processes, Planning, Attention, Simultaneous, and Successive processing. Scale scores are based on a mean of 100 with a standard deviation of 15.

Instrument

Cognitive Assessment System

The Cognitive Assessment System was developed based on the PASS theory which indicates the four PASS processes are the basic building blocks of intellectual functioning (Naglieri, 1999). These different processes, although distinct, work together interdependently being “involved in activity and interacting with the person’s fund for knowledge.” (Naglieri & Das, 1997). It is an individually administered test for children ages 5 through 17 years. It is comprised of 12 subtests, three in each of the PASS scales. Subtest scores are scaled with a mean score of 10 and a standard deviation of 3. The CAS produces a Full Scale I.Q. score as well as four scale scores (Planning, Attention, Simultaneous Processing, and Successive Processing) based on the PASS processes. Each scale is expressed as a standard score with a mean of 100 and standard deviation of 15. The CAS can be administered in either an eight subtest Basic Battery (two subtests per PASS Scale) or a 12 subtest Standard Battery (three subtests per PASS Scale). Only the Basic Battery was used for this study.
**Planning Scale**

The Planning subtests of the CAS measure the student’s ability to select, use, and modify plans or strategies for the efficient completion of novel tasks. Self-monitoring the effectiveness of strategies used, and verbally describing the strategies are involved in planning. Planning subtests are timed measures in which scores are derived from a combination of completion time and number of items correct.

**Matching Numbers.** The Matching Number subtest requires the student to quickly find and underline pairs of numbers up to seven digits in length that are displayed within rows of similar but different numbers. The effective use of strategies results in a higher score. Strategies are observed and recorded by the examiner, who asks the student to describe how they completed the items.

**Planned Codes.** For this subtest, students are required to follow a key, matching simple letter codes (OX, XX, OO, and XO) with the letters A through D. The student must quickly fill in the codes on pages where the letters are arranged in different patterns. No prescribed method of completion is given; instead children are encouraged to fill in the items any way they want. The efficient and effective use of strategies including the use of the pattern, results in a higher score. The examiner observes and records the strategies used, and asks the student to describe how the items were completed.

**Attention Scale**

The Attention subtests of the CAS are designed to evaluate the student’s ability to focus cognitive activity while ignoring or inhibiting distractions. Efficient, selective, and sustained focus on particular information is essential for satisfactory completion of these
subtests which are timed. Scores are based on number of items correctly completed (errors are subtracted from total items completed) and time required for task completion.

Expressive Attention. This subtest requires the student to name a quality about the stimulus presented (i.e. the color ink in which a color word is printed) while suppressing a more natural or automatic way of responding (i.e. reading the word itself). The task is similar to the Stroop test (Stroop, 1935).

Number Detection. This subtest requires the child to find and underline specific numbers on a page within rows of numbers, many of which are very similar to the target items. This subtest is timed and the child’s score is derived from the amount of numbers correctly underlined (errors subtracted from the total items completed) combined with the time required for task completion.

Simultaneous Scale

This scale of the CAS requires the student to examine stimuli for patterns and inter-relatedness. The integration of separate stimuli into meaningful perceptual or conceptual wholes and how separate parts relate to one another is the central aspect of simultaneous processing. Scores are based on number of items completed correctly.

Nonverbal Matrices. For this subtest, visual patterns of shapes or geometric designs that are inter-related through spatial or logical organization are presented with a piece missing. The student must select from a field of six similar items the correct item which will complete the pattern. Naglieri and Das (1997) have stated that a substantial number of matrices tasks have been used as measures of simultaneous processing.
Verbal-Spatial Relations. This subtest includes items which consist of six drawings each with a question printed at the bottom of each page which is read by the examiner. The questions ask which picture exhibits a specific spatial arrangement. Only one picture will have the required qualities, although all six may be very similar. Student responses are required within a 30 second time limit. This subtest evaluates the students' comprehension of logical grammatical relationships.

Successive Scale

Successive processing subtests are intended to measure the child’s ability to maintain and comprehend the serial organization of information. All tasks involve verbal presentation of words or sentences where meaning can only be derived from the order of words. Words and sentences although real and grammatically correct, are not meaningful (e.g. "The white blued the green after pinking the purple).

Word Series. This subtest consists of series of up to nine unrelated words which are presented by the examiner verbally. The same nine words are used throughout the subtest so that the student does not have to rely heavily on short-term recall of novel information. The student must orally repeat the words in exactly the same order they are presented.

Sentence Repetition. For this subtest, sentences with limited semantic content are presented orally for the child to repeat back verbatim. Semantic content is decreased by the use of color words in place of nouns, verbs, and adjectives. Thus, only the sequence of the sentence’s words remains important.
Standardization

The CAS Standardization Edition was administered to a total of 3072 children, ages 5 years, 0 month to 17 years, 11 months, in 68 sites across the United States (Naglieri & Das, 1997). The normative sample was derived from test results for 2200 of these children, and the other 872 participated in studies of reliability and validity. Demographic characteristics closely matching the United States population on gender, race, region, community setting, classroom placement, educational classification, and parental education are reported for the standardization sample (Naglieri & Das, 1997).

Raw score distributions for the subtests were normalized and converted to scaled scores with a mean of ten and a standard deviation of three for one year age intervals. Naglieri and Das (1997) reported that minor irregularities in score progressions were “smoothed” (p. 42). PASS Scale standard score distributions were developed from summed subtest scaled scores in each scale, and the Full Scale score distribution is derived from the sum of all subtest scaled scores given (8 for the Basic Battery and 12 for the Standard Battery). Analyses of the distributions yielded no significant differences by age.

Validity

Content Validity. Content validity refers to the extent to which an instrument's items are representative of the variable which it is intended to measure. The constructs of the CAS were evaluated through a number of research studies, pilot tests, a national tryout, and the national standardization to operationalize them. These constructs were
derived from more than 20 years of research and development (Naglieri and Das 1997). Naglieri and Das (1997) described a process of task analysis combined with experimental examination in the development of CAS tasks. An emphasis was placed on keeping the theoretical basis for the CAS intact by the authors.

Construct Validity. Construct validity refers to the extent to which a test instrument measures one or more hypothetical variables. CAS subtests and Scales are intended to measure PASS theoretical constructs. To test this, factor analytic techniques were applied to CAS standardization data (Naglieri & Das, 1997). Confirmatory factor analyses by four age groups yielded Goodness-of-Fit (GFI) and Adjusted Goodness-of-Fit (AGFI) indices above .90. One, two, three, and four factor models were also analyzed by age groups. Statistically significant (p < .01 or p < .05) chi-square incremental improvement values were found for the four factor model for three age groups. A three factor model was best suited for the 11-13 year old age group, with planning and attention emerging as a single factor. Naglieri and Das (1997) have acknowledged that these two areas are very closely related, but have also emphasized that their theoretical distinctiveness should not be ignored simply on the basis of factor solutions.

Several exploratory analysis techniques were also used on the same sample data to evaluate construct validity. Three or four factor models emerge as best solutions depending on age group; for some, the attention and planning factors again emerge as a single factor.

Criterion-Related Validity. Criterion-related validity is the degree to which the scores of a test instrument relate to outcome criteria, such as scores on instruments which
measure the same or similar constructs, or the degree to which individual scores can forecast a criterion situation. One of the stated uses of the CAS is prediction of academic achievement. 1,600 children ages 5 to 17 were administered both the CAS and the Woodcock-Johnson Tests of Achievement – Revised (WJ-R; Woodcock & Johnson, 1989) at the same time. Correlation values for CAS Basic Battery Full Scale (.74) and PASS Scale (.44 to .64) scores with WJ-R subtest and cluster scores were all significant (p < .01) for this sample.

Samples of mentally retarded (n = 80), learning disabled (n = 80), and regular education (n = 46) students were given the CAS, WJ-R, and WISC-III. Correlations between the WJ-R Skills cluster score and both CAS and WISC-III Full Scale scores are similar across all three groups (ranging from .38 to .66). Across the three groups, correlations between the CAS Full Scale scores and WJ-R scores were significant (p<.05). Greater detail of these and several other studies are reported by Naglieri and Das (1997)

Reliability

**Internal Consistency.** Internal consistency is measured using split half reliability, which refers to the degree of correspondence in a group of items, and test-retest reliability, which is the extent to which test instrument scores are consistent over time. Preferred total test split-half internal reliability coefficient is .90 or above, and subtest coefficient is .80 or above (Bracken, 1987).
Split-half reliability coefficients for Simultaneous and Successive subtests (except Speech Rate) were calculated using the entire standardization sample. Test-retest reliability was used with the Planning and Attention subtests, and the Successive Scale Speech Rate subtest. Test-retest reliability was used for these subtests because they all involve time and cannot be divided meaningfully for split-half reliability measurement. Mean corrected correlation coefficients for PASS Scale and Full Scale scores range from .84 (Basic Battery Attention Scale) to .96 (Standard Battery Full Scale). Mean subtest coefficients range from .75 (Matching Numbers) to .89 (Nonverbal Matrices and Figure Memory). Naglieri and Das (1997) summarize results as being consistent with what is typical for a test of cognitive abilities.

Test-retest reliability was evaluated for the entire CAS with a sample of 215 children from the standardization sample over a period of from 9 to 73 days. Averaged PASS Scale and Full Scale corrected stability coefficients range from .77 (Basic Battery Simultaneous Scale) to .91 (Standard Battery Full Scale). Average subtest coefficients range from .67 (Verbal Spatial Relations) to .80 (Planned Codes, Sentence Repetition).

Data Collection

To find ED students with pertinent data, lists of ED students from the Muskingum Valley Educational Service Center and Columbus Public Schools were searched to determine who had been administered the CAS as part of a multi-factored evaluation (MFE) between September, 1998 and December, 2002. All available ED students who had been given the CAS were noted. Archival records of evaluations for these individuals were then searched for useable data. Complete CAS scores and demographic
information was found for 59 students identified as ED. CAS Basic Battery scores were obtained from test protocols or from MFE reports. Demographic data for each subject were gathered from computer database records maintained by the school districts. To meet the number of subjects needed, data for an additional 13 students identified as ED was supplied by the author of the CAS from data collected during standardization of the CAS. Subjects for this data were from various districts around the United States and was collected between 1995 and 1997.

The sample of ED students was then matched to a non-ED sample from the CAS standardization sample of 2200 children. Matching variables included age, race, gender, geographic region, and socio-economic status. Socio-economic status was measured and reported for students in the CAS standardization sample in the form of parental education level. Levels were as follows: less than high school degree, high school degree or equivalent, some college or technical school, and four years or more of college. This parental education level data was ascertained through a parent questionnaire. For students whose data was from school archival records, socio-economic status was measured as students who received a free or reduced lunch or not. Students receiving a free or reduced lunch were matched to standardization children whose parental education level was in the less than high school degree category. Free or reduced lunch and parental education level of less than high school degree were considered Low SES. All other students who did not fall in the Low SES category, were considered Higher SES.
Experimental Design and Analysis

This study was primarily exploratory in nature using CAS scores for group comparison. As this study is exploratory, it does not present any specific hypothesis to be tested. However, the set of questions which follow this section will be analyzed statistically. Questions one and two will be analyzed using independent t-tests. Question three will be analyzed using a discriminant analysis in order to determine the extent to which the CAS differentiates the two groups and to determine which scales predict group membership. Question four will be analyzed using the intra-individual ipsative approach described by Naglieri (2000)

Research Questions

The research questions to be answered are as follows:

5) Do the two groups, ED and the control, differ significantly on the CAS measure of general intelligence (Full Scale score)?

6) Do the two groups, ED and the control, have significantly different PASS scores?

7) Do one or more specific PASS scales predict which group a student belongs to?

8) Does the ED group overall have significant cognitive weaknesses?
CHAPTER 4

RESULTS

Introduction

This chapter summarizes the results of data analyses which were completed to examine the relationship between CAS PASS cognitive processes and students with emotional disturbance (ED). The first section provides descriptive and demographic data. In the second section, CAS score variable data are summarized and compared. The third section addresses the analyses of the research questions stated in chapter three.

Descriptive Data

An original sample of 72 ED subjects was collected. Eight subjects were deleted from the sample because cases were not found which included all variables for matching. Data for a total of 128 subjects, 64 in each group, were collected. This sample size exceeded the target goal of 124 subjects, 62 for each group, set in chapter three.

Demographic Variables. The districts from which data were collected recorded race and gender information which is summarized in Table 4.1. The sample was about
one third Black, two thirds White, and a small percentage Hispanic. 102 children in the sample were male, making up 79.7 percent, and 26 were female, making up 20.3 percent of the sample. Table 4.2 summarizes race and socio-economic status.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Black</th>
<th>Hispanic</th>
<th>White</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>37</td>
<td>36.3</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>19.2</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>32.8</td>
<td>6</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Table 4.1 Frequencies and Percentages for Race and Gender

<table>
<thead>
<tr>
<th>SES</th>
<th>Black</th>
<th>Hispanic</th>
<th>White</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Low</td>
<td>21</td>
<td>48.8</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td>Regular</td>
<td>21</td>
<td>24.7</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Total Sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>42</td>
<td>32.8</td>
<td>4</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Table 4.2 Frequencies and Percentages for Race and Socio-Economic Status
The age range for the students in the sample was six years, zero months, to seventeen years, zero months. The mean age was eleven years, one month, with a standard deviation of three years, 1.5 months. The data collection for the standardization of the CAS included four regions of the United States; West comprising California, Oregon, Washington, Idaho, Utah, Nevada, Wyoming, Montana, Colorado, New Mexico, and Arizona; South comprising Texas, Oklahoma, Louisiana, Mississippi, Florida, Alabama, Georgia, Arkansas, Kentucky, Tennessee, South Carolina, North Carolina, Virginia, and West Virginia; North East comprising Maine, Vermont, New Hampshire, Massachussetts, Connecticut, New York, Pennsylvania, Maryland, New Jersey, Delaware, and Rhode Island; and Mid West comprising Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota. The majority of children (n = 98, 76.6%) came from the North Central region with the South region being the next largest group (n = 20, 15.6%). Table 4.3 provides Region and Age data for this sample.
<table>
<thead>
<tr>
<th>Region</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Central</td>
<td>98</td>
<td>76.6</td>
</tr>
<tr>
<td>North East</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>South</td>
<td>20</td>
<td>15.6</td>
</tr>
<tr>
<td>West</td>
<td>8</td>
<td>6.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>8</td>
<td>6.3</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>9.4</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
<td>12.5</td>
</tr>
<tr>
<td>9</td>
<td>20</td>
<td>15.6</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>4.7</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>9.4</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>6.3</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>10.9</td>
</tr>
<tr>
<td>14</td>
<td>12</td>
<td>9.4</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>4.7</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
<td>6.3</td>
</tr>
<tr>
<td>17</td>
<td>6</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Table 4.3  ED and Non-ED Sample Frequencies for Region and Age
Comparison of Variables

CAS and Demographic Variables: Table 4.4 summarizes mean CAS scale scores by gender, race, and SES. Independent samples t tests were used to compare gender, SES, and race on the dependent variable (CAS PASS and Full Scale Scores). On average, males and females in the sample earned equivalent CAS scores. For the t test comparing race, Hispanic subjects were omitted because of a relatively low n for that group (n = 4). On average, Blacks and Whites in the sample earned equivalent CAS scores. Low SES subjects earned significantly lower Simultaneous Scale scores (t = -2.11, df = 126; p < .05) than Higher SES subjects. Low SES students also earned significantly lower (t = -2.16, df = 126; p < .05) Full Scale scores than Higher SES students.
<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>Planning</th>
<th>Attention</th>
<th>Simultaneous</th>
<th>Successive</th>
<th>Full Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>102</td>
<td>88.09</td>
<td>91.73</td>
<td>95.02</td>
<td>95.20</td>
<td>89.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(15.31)</td>
<td>(13.04)</td>
<td>(14.94)</td>
<td>(14.33)</td>
<td>(14.83)</td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>92.96</td>
<td>96.62</td>
<td>95.50</td>
<td>98.77</td>
<td>94.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(17.77)</td>
<td>(16.40)</td>
<td>(15.51)</td>
<td>(11.90)</td>
<td>(15.82)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>42</td>
<td>87.71</td>
<td>89.67</td>
<td>92.95</td>
<td>94.02</td>
<td>88.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(14.60)</td>
<td>(11.88)</td>
<td>(13.71)</td>
<td>(12.96)</td>
<td>(12.53)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4</td>
<td>108.75</td>
<td>105.00</td>
<td>99.75</td>
<td>88.50</td>
<td>100.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.38)</td>
<td>(23.63)</td>
<td>(19.60)</td>
<td>(9.89)</td>
<td>(17.37)</td>
</tr>
<tr>
<td>White</td>
<td>82</td>
<td>88.82</td>
<td>93.68</td>
<td>96.00</td>
<td>97.26</td>
<td>91.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.06)</td>
<td>(14.76)</td>
<td>(15.46)</td>
<td>(14.42)</td>
<td>(16.06)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SES</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>43</td>
<td>86.19</td>
<td>90.26</td>
<td>91.23*</td>
<td>93.00</td>
<td>86.74*</td>
</tr>
<tr>
<td>Regular</td>
<td>85</td>
<td>90.54</td>
<td>93.96</td>
<td>97.08*</td>
<td>97.40</td>
<td>92.75*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.43)</td>
<td>(14.76)</td>
<td>(15.94)</td>
<td>(13.83)</td>
<td>(16.01)</td>
</tr>
</tbody>
</table>

* denotes significant t-test difference, p<.05

Table 4.4 Mean CAS PASS Scale Scores and Standard Deviations (in parenthesis) by Gender, Race, and Socio-Economic Status (SES)

CAS and Group Variables. Table 4.5 summarizes CAS PASS and Full Scale standard scores for the sample by ED and non-ED group. All mean CAS Scale scores were below the standard score mean of 100. The overall mean Full Scale score for the
non-ED group was 5.02 points below the standard score of 100. A one sample t test comparing the non-ED group’s overall mean Full Scale score to the standard score of 100 yielded a t value of -2.48 (df=63), which is significant at p < .05, indicating that the mean Full Scale score for the non-ED sample is significantly different from the population mean of 100. Similarly, the ED group’s mean Full Scale score was significantly below the mean standard score of 100 (t(df=63)= -8.59, p<.001). The average of all scale scores were within the 15 point standard deviation of the CAS except Planning for the ED group.

The ED groups’ Full Scale score was 8.5 points below the non-ED groups’ Full Scale score. An independent samples t-test indicated that this difference was significant (t(126)= -3.31, p<.001). Differences between the four PASS scale scores for groups was also tested using an independent samples t-tests. The ED group was significantly below the non-ED group on the Planning (t(df=126)= -4.11, p<.001) and Attention (t(df=126)= -3.60, p<.001) subtests.
### Table 4.5 CAS Scores by Group

<table>
<thead>
<tr>
<th>CAS Scale</th>
<th>ED Group Mean (n=64)</th>
<th>ED Group SD</th>
<th>Non-ED Group Mean (n=64)</th>
<th>Non-ED Group SD</th>
<th>Total Mean (n=128)</th>
<th>Total SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>83.64*</td>
<td>13.77</td>
<td>94.52*</td>
<td>16.09</td>
<td>89.08</td>
<td>15.89</td>
</tr>
<tr>
<td>Attention</td>
<td>88.36*</td>
<td>13.39</td>
<td>97.08*</td>
<td>14.07</td>
<td>92.72</td>
<td>14.36</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>92.81</td>
<td>14.00</td>
<td>97.42</td>
<td>15.71</td>
<td>95.12</td>
<td>15.00</td>
</tr>
<tr>
<td>Successive</td>
<td>95.61</td>
<td>13.14</td>
<td>96.23</td>
<td>14.72</td>
<td>95.92</td>
<td>13.90</td>
</tr>
<tr>
<td>Full Scale</td>
<td>86.48*</td>
<td>12.59</td>
<td>94.98*</td>
<td>16.21</td>
<td>90.73</td>
<td>15.07</td>
</tr>
</tbody>
</table>

* denotes significant t-test difference, p<.001

Pearson correlations between PASS scales by group is reported in table 4.6.

Pearson correlations between PASS scales and Group were calculated. The correlation between Group and Planning scale was significant ($r (n = 128) = .344, p<0.01$) as was the correlation between Group and Attention scale ($r (n = 128) = .305, p<0.01$). Pearson correlations between CAS scores and age for the entire sample ($n = 128$) were not significant (Age and: Planning, $r = -.130$, Attention, $r = .018$, Simultaneous, $r = -.064$, Successive, $r = -.103$, and Full Scale, $r = -.115$).
<table>
<thead>
<tr>
<th>CAS Scale</th>
<th>Planning</th>
<th>Attention</th>
<th>Simultaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.600*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>.450*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ED</td>
<td>.639*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Simultaneous</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.374*</td>
<td>.375*</td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>.263**</td>
<td>.141</td>
<td></td>
</tr>
<tr>
<td>Non-ED</td>
<td>.410*</td>
<td>.524*</td>
<td></td>
</tr>
<tr>
<td><strong>Successive</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.282*</td>
<td>.308*</td>
<td>.441*</td>
</tr>
<tr>
<td>ED</td>
<td>.180</td>
<td>.139</td>
<td>.294**</td>
</tr>
<tr>
<td>Non-ED</td>
<td>.379*</td>
<td>.468*</td>
<td>.561*</td>
</tr>
</tbody>
</table>

* Denotes significance at the 0.01 level (two-tailed test)
** Denotes significance at the 0.05 level (two-tailed test)

Table 4.6 Correlation Coefficients between CAS PASS Scale Scores by Group.

**Group and Social/Emotional Scales**  Of the 64 ED subjects, rating scale scores were available for 36 students. Internalizing and Externalizing Scale data were available from either the Behavior Assessment Scales for Children, Teacher Rating Scale (BASC) or from the Achenbach Teacher Report Form (TRF). Each of these scales provides T-scores in which a score above 60 is considered significant. Overall, the ED group was rated higher in externalizing behavior with a mean T-score of 73.50 than internalizing behavior (mean T-score of 62.44) These data are summarized in table 4.7.

56
<table>
<thead>
<tr>
<th>Above 60</th>
<th>n</th>
<th>%</th>
<th>Mean Total</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalizing</td>
<td>25</td>
<td>69.40</td>
<td>62.44</td>
<td>6.72</td>
<td>50.00</td>
<td>79.00</td>
</tr>
<tr>
<td>Externalizing</td>
<td>33</td>
<td>91.70</td>
<td>73.50</td>
<td>8.63</td>
<td>54.00</td>
<td>88.00</td>
</tr>
</tbody>
</table>

Table 4.7 Rating Scale Score Frequency and Percentage by Group (n = 36).

Group Prediction A discriminant analysis was used to best determine A) the extent to which the two groups could be predicted on the basis of their CAS scores, and B) which scales best predicted group membership. Specifically, a stepwise discriminant function analysis was computed using the four PASS scale scores to determine the “best” set of discriminators (Stevens, 1995). A stepwise analysis was chosen because there was no theoretical reason to assign a higher priority of entry for specific subtests over others. Planning was the first and only subtest to enter the equation as it best predicted group membership (Wilks’ Lambda = .883, p<.001) indicating that this discriminant function was significant. In order to determine the predictive power of the discriminant function, a classification analysis was conducted. Table 4.8 summarizes the prediction results. Using the sample proportions as prior probabilities, 65.5% of the cases were classified correctly, compared to 50% that might be classified by chance alone. Subjects in the SED group were more likely to be classified correctly (73.4% of the time) than were subjects in the normal sample (57.8% of the time).
<table>
<thead>
<tr>
<th>Group</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>ED</td>
<td>47</td>
<td>73.4</td>
</tr>
<tr>
<td>RE</td>
<td>37</td>
<td>57.8</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>65.6</td>
</tr>
</tbody>
</table>

Table 4.8 Predicted Group Membership Accuracy Results

**Group Weaknesses**  Naglieri (2001) recommends an ipsative or intra-individual approach to evaluating each of the PASS scores for significant cognitive weaknesses. An intra-individual approach to sub-test and sub-score analysis is a technique that has been implemented for evaluating performance on various intelligence tests (Kaufman, 1994; Sattler, 1992). This approach compares each of the four PASS Scale standard scores to the average of those four scores. If one or more scores is significantly lower than the average then it can be considered a weakness. The differences are compared to a table listing differences needed for significance provided in the CAS manual (Appendix D, Table D.3, Naglieri and Das, 1997). In this study, each of the subjects’ CAS PASS scale scores were evaluated for a cognitive weakness using the method described above. Table 4.9 summarizes these results.
<table>
<thead>
<tr>
<th>PASS Scale</th>
<th>ED</th>
<th>%</th>
<th>Non-ED</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Weakness</td>
<td>21</td>
<td>32.8</td>
<td>13</td>
<td>20.3</td>
<td>34</td>
<td>34.0</td>
</tr>
<tr>
<td>Attention Weakness</td>
<td>12</td>
<td>25.0</td>
<td>8</td>
<td>12.5</td>
<td>24</td>
<td>18.8</td>
</tr>
<tr>
<td>Simultaneous Weakness</td>
<td>8</td>
<td>12.5</td>
<td>8</td>
<td>12.5</td>
<td>16</td>
<td>12.5</td>
</tr>
<tr>
<td>Successive Weakness</td>
<td>6</td>
<td>9.4</td>
<td>10</td>
<td>15.6</td>
<td>16</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Table 4.9 PASS Scale Comparison by Group (Total n = 128).

Analysis of Research Questions

Research Questions

1) The research questions proposed non-ED and ED students differ significantly on the CAS measure of general intelligence (Full Scale score)?

2) Do the two groups, ED and non-ED, have significantly different PASS scores?

3) Do one or more specific PASS scales predict which group a student belongs to?

4) Does the ED group overall have a significant weakness?
**Question One:** The ED groups' Full Scale CAS score was 86.48 and the non-ED groups' Full Scale CAS score was 94.98. The difference between the two groups' Full Scale scores was 8.5. An independent samples t-test indicated that the this difference was significant (p<.001). Hence, for this sample, students with ED generally have a significantly lower CAS Full Scale score than the RE students.

**Question Two:** Figure 4.1 depicts the average scores for each group. Of the four PASS scale scores the differences between groups of the Planning and Attention scales were significant (p<.001). The RE groups' average Planning score was 10.88 points higher than the ED groups' Planning score, indicating RE students from this sample generally have a higher Planning score. Similarly, the RE group from this sample generally has a higher Attention score than the ED group with an average Attention score 8.72 points higher than the ED groups' average Attention score. The differences between the groups' Simultaneous and Successive scores were not significant indicating these scores are generally the same for each group.
Figure 4.1  CAS Scale Scores by Group

Question Three: The significant discriminant function included Planning as it’s only and strongest variable. This function was able to correctly predict group membership 65.5% of the time. This prediction is 15.5% above what would be predicted by chance alone. Subjects in the ED group were classified correctly 73.4% of the time, and subjects in the normal sample were classified correctly 57.8% of the time.

Table 4.10 presents the mean CAS scores for each group, split by how they were classified by the discriminant analysis (correctly or incorrectly). The mean CAS scores for the incorrectly classified ED group were higher than the correctly classified ED group. The difference is most stark on the Planning scale where the incorrectly classified group of ED students was 23.66 points higher than the correctly classified group.
Conversely, for the non-ED group, each mean CAS score was higher for the correctly classified group than the incorrectly classified group with the Planning scale showing a 25.62 point difference between correctly and incorrectly identified students.

<table>
<thead>
<tr>
<th>CAS Scale</th>
<th>ED Group</th>
<th>Non-ED Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correctly Classified</td>
<td>Incorrectly Classified</td>
</tr>
<tr>
<td>Planning</td>
<td>77.34 (9.48)</td>
<td>101.06 (7.03)</td>
</tr>
<tr>
<td>Attention</td>
<td>85.57 (12.05)</td>
<td>96.06 (14.21)</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>91.32 (13.22)</td>
<td>96.94 (15.64)</td>
</tr>
<tr>
<td>Successive</td>
<td>94.11 (12.84)</td>
<td>99.76 (13.46)</td>
</tr>
<tr>
<td>Full Scale</td>
<td>82.40 (10.62)</td>
<td>97.76 (10.76)</td>
</tr>
</tbody>
</table>

Table 4.10 Mean (Standard Deviation) CAS Scores by Group and Classification.
Question Four. A Chi-Square test, if a subject did or did not have a weakness by Group, was calculated for each PASS scale. Notably, Attention was within .005 points of significance ($\chi^2 (df = 1) = 3.28, p = 0.56$) and Planning had a similar result being within .03 of significance ($\chi^2 (df = 1) = 2.56, p = 0.08$). The Simultaneous and Successive scales were not significant (Simultaneous, $\chi^2 (df = 1) = 0.00, p = 0.61$; Successive, $\chi^2 (df = 1) = 1.14, p = .212$).
CHAPTER 5

DISCUSSION

Introduction

This study examined the relationship of Planning, Attention, Simultaneous, and Successive (PASS) cognitive processes to children identified in schools with emotional disturbance (ED) and children not identified as ED (non-ED). The Cognitive Assessment System (CAS; Naglieri & Das, 1997) was used to measure the four PASS processes as well as overall intellectual ability.

Generally, research findings indicate that ED students have lower Full Scale IQs than non-ED students (Kauffman, 2001). The notion is not that this correlation is causal, especially when other students with relatively low IQ may not manifest an emotional disturbance. The notion that specific cognitive factors may play a causal or interactionary role in emotional disturbance has been suggested (Knoff, 2002).

The findings of this study reflect similar findings of other studies and add to those studies in some ways. Results here indicate that the ED group of students earned significantly lower Full Scale CAS scores than the non-ED students, which parallels other research of intellectual ability and ED (Duncan, Forness, and Hartsough, 1995;
Kauffman, Cullinan, and Epstein, 1987, Motto and Wilkins, 1968, Clarizio, and Higgins, 1989). The finding that Planning and Attention scores were significantly lower for the ED group and that Planning contributes to some differentiation of ED versus non-ED provides added insight into the cognitive functioning of ED students.

Findings

That the two groups, ED and the control, differ significantly on the CAS’s measure of general intelligence is not a surprising finding. The 8.5 point difference, with the ED group’s score lower, is similar to other studies’ findings (Duncan, Forness, and Hartsough, 1995; Kauffman, Cullinan, and Epstein, 1987, Motto and Wilkins, 1968, Clarizio, and Higgins, 1989) and reflects Kauffman’s (2001) notion that the average IQ for ED students is 5 to 10 points below non-ED students.

Considering that ED student’s typically have IQs below average students and that IQ is the best single predictor of academic achievement (Sattler, 1992), it seems to follow that these students may have more school difficulty. However, many students demonstrate lower IQ scores yet do not develop any severe problems in school. Thus, it is insufficient and myopic to not look beyond full scale IQ scores to understand and work with ED students. Certainly other factors outside of cognitive ability have a role in the disability (Koff, 2002) but factors within cognitive ability appear to have a role as well.

In this study, the two groups, ED and the control, had significantly different Planning and Attention scores. On average, ED students scored 10.88 points, significantly below the non-ED students on the CAS measure of Planning, and 8.72 points, significantly below the non-ED students on the CAS measure of Attention. A
few studies that most closely resemble this one, have had similar findings. Daley et al (1997) used the CAS standardization edition to compare 40 ED children to 40 non-ED children. Their results suggested Planning was the strongest predictor variable between the groups, with the ED group being lower in Planning than the non-ED group. Another study found that 30 incarcerated, delinquent white males differed significantly on Attention. Lastly, Stephens (2000) looked at Achenbach Teacher Report Form (TRF) scores and CAS PASS scores for a group of students referred for special education identification. Stephens found that Planning and Attention scores were significantly associated with high Inattentive Syndrome, Externalizing Composite, Unpopular, Self-Destructive and Syndrome scale scores. High Internalizing Composite scores also manifested cognitive processing problems in CAS Planning.

The fact that both Planning and Attention were significantly lower for the ED group in the study presented here, and that Planning and Attention are the only scales that include timed subtests, present a possible issue. The Planning and Attention scale correlation was the strongest total sample correlation between the PASS scales (r (n = 128) = .600, p<0.01). However, the ED subjects had a lower correlation (r = .450) between Planning and Attention than the non-ED group (r = .639). Thus, for the ED group, Attention and Planning were not as strongly related.

ED students are often described as having poor self-control (Kauffman, 2001). The Planning scale includes a coding task in which the subject must copy specific codes from a key at the top of a page as quickly as possible and find matching numbers among a list of numbers, as quickly as possible. The Planning scale requires planful and efficient self-regulation, hence a subject that efficiently plans, enacts, and manipulates
good strategies will complete the Planning subtests quickly and correctly and will score higher than a subject who does not. It appears that in many cases, ED students do in fact lack the self-regulation needed to perform well on the Planning scale.

ED students are also at times described as inattentive although inattentive is often combined with hyperactive (Kauffman, 2001). Subtests in the Attention scale include items that require the subject to search for and underline specific characters amongst numerous other similar, and distracting, characters as quickly as possible. The Attention scale also includes a section in which the subject must quickly say the colors words are written in when the words themselves are opposite color words, thus “competing” for attention. The Attention scale requires the selective attention or focus on a paper and pencil task placed in front of the student. The attention system of the brain is responsible for maintaining the appropriate level of mental activity and ensuring important stimuli are given the required processing (Kirby and Williams, 1991). Although attention is related to “focus”, problems with attention could be affected by how it is regulated, thereby underlying its close relationship to self-regulation or planning (Kirby and Williams, 1991). ED students in some cases appear to have difficulty with attention as well.

Even though Attention was a factor, the discriminant analysis revealed Planning was the strongest predictor. Once the variance, or similarity, the Attention scale shared with Planning was removed, Attention did not have as strong a value. Keith et. al (2001) suggest that the Planning and Attention processes on the CAS are difficult to distinguish and that they actually represent the same construct. However, during the standardization of the CAS, the authors used confirmatory factor analysis to evaluate if other models better represented the data. The models were: a one-factor model where all
subtests comprised one factor; a two factor model where Planning and Attention comprised one factor and Simultaneous and Successive comprised the other; a three factor model where Planning and Attention comprised one factor and Simultaneous comprised a second factor, and Successive comprised the third; and the four factor PASS model. At every age, except for ages 11 to 13 years, the four factor PASS model was a significant improvement over the next best model (Naglieri, 1997). For the 11 to 13 year group, one model did not show superiority to another. Hence, some similarity does exist between the scales of Planning and Attention, likely because they enlist processes that interact closely (Kirby and Williams, 2001). However, in theory and in practice generally they are they are separable.

The limited research base presented here underlines Planning and Attention as possible factors in emotional and behavioral problems. Here, of the four PASS scales, Planning was the greatest difference and best predicted group membership. In this study what has been conceptualized as planning processing is the most significant cognitive factor in emotional disturbance of the factors measured. Kirby and Williams (1991) indicate the planning system, located in the frontal lobe of the brain, is responsible for the construction, execution, and monitoring of plans for processing. Similarly, Naglieri (1999) explains that the Planning subtests require a plan of action, evaluation and monitoring of the plan, and control of the impulse to act without careful consideration. Simply, planning requires self-regulation. Bowers (1981) stated, when describing the emotionally handicapped child, "Such individuals deal with emotional tensions by rapid action rather than by internalizing the subsequent anxiety. Whereas most children develop a core of self or ego processes that mediate forces in the environment and in the

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organism, some children may have a deficiency of such processes” (pg. 119). It is possible that Planning as measured by the CAS, is such a process and that it may lend an operationalized factor or part to the definition of emotional disturbance.

Application

Using science to find out what we can about human behavior is an obligation we have to those we are serving and not doing so might be considered mulish (Kaufmann, 1999). Kaufmann (1999) eloquently states, “The implication is that what we assume to be true about emotional and behavioral disorders is tentative. But our best option is to look to present scientific understanding for best practices and to scientific study for the revision of most of our truths” (pg. 270). Using the findings presented here and other recent findings using newer technology, to better understand, and possibly identify and instruct students with ED, seems appropriate.

In his Best Practices in Personality Assessment chapter in which he focuses on the identification and provision of services for Children with ED, Knoff (2002) insists that a child’s cognitive status must be examined. He points out that a child’s social skills and emotional reaction to frustration may be closely related to cognitive skills and developmental status. Although more information is needed on the cognitive abilities of ED students, simply knowing that these students may have deficits in Planning may positively impact decision making and instructional planning for these students. Bowers (1982) notes that if children with emotional disturbance are not served early, special service costs and educational effectiveness diminishes. In terms of decision making, imagine a student whose situation includes the host of environmental factors that
typically accompany emotional disturbance, but does not show the severity of disturbance currently required for formal identification. That child very well may not be provided much needed intervention until after severe symptoms develop. Children who are evaluated with the above factors and results showing cognitive difficulty in Planning, it may be the “red flag” that calls attention to these children and hopefully early intervention.

For teachers, knowing the cognitive make-up of ED students may help them better understand the instructional needs for these children and better cope in the classroom. Classroom interventions have been developed and tested for Planning (Ashman & Conway, 1993; Naglieri & Gottling, 1995, 1997; Naglieri & Johnson, 1998) and Attention (Douglas, 1980; Kirby & Williams, 1991). These studies have been primarily academic in nature, which would be helpful to the ED student in itself, but they may be extended to address performance related to behavioral and emotional problems as well.

A recent study involved learning disabled students low in Planning who were taught math using an instructional approach which focused on planning processes (Naglieri & Gottling, 1995). Rather than instructing students in a traditional manner, telling them which math problems they had done right or wrong or specifically how to do mechanical operations, Naglieri and Gottling taught students to be planful in their approach to math problems. Instruction encouraged students to determine how they did the pages, to verbalize and discuss their methods, and to be self-reflective. Teachers asked questions such as, “How did you do the problems and why”? “What will you do next time”? “What did you notice on this page”? In order to facilitate a reflective and
planful approach to solving problems. Students low in Planning improved more than students not low in Planning and improved more than students taught with a more traditional method. An approach to intervention with ED students low in Planning that focuses on academic and behavioral areas, may be similarly successful.

Various studies have been described which teach self-monitoring or self-regulation (Levendoski & Cartledge, 2000; Peterson, Young, West, Peterson, 1999; Scott, 1998) which is related to planning. Levendoski and Cartledge (2000) taught elementary school students identified as ED an unobtrusive self-monitoring procedure. The procedure included having students monitor and record their behavior on a card while working independently on new material. Four ED students who had low levels of on-task behavior were taught to put a check on a card whether they were doing their work or not, each time a timer sounded. A positive relationship was found between self-monitoring and percentage of on-task behavior during math seatwork and percentage of math problems completed. Maintenance after the self-monitoring intervention was removed was variable.

Studies such as Levendoski and Cartledge’s (2000) when used with ED students with low planning ability, may provide the most effective pairing of intervention to disability. It could be informative to replicate their study comparing two groups of students with ED, one group low in Planning and the other not low in Planning to see if results between the groups were similar to the Naglieri and Gottling (1995) study. “Perhaps one of the most convincing arguments against IQ tests is that the results are largely unrelated to the design, implementation, and evaluation of interventions…” (NRC, 2002) It is possible that future research could reveal that ED students measured
low in Planning profit more from intervention techniques designed to facilitate planning and self-regulation more than students not low in Planning. If this is the case, intervention approaches may be selected according to this type of measure and thus demonstrate some level of treatment utility.

A final point from the data collected, although not directly related to the research questions, may be interesting to consider. It has been suggested that culturally diverse students may be particularly susceptible to misdiagnosis (CCBD, 1989). Current statistics (22nd ARC, 2001) indicate that the current identified ED population of black students is 26.4 percent and whites is 61.6 percent. This can be contrasted to the U.S. resident population of 14.8 black students and 66.2 white students. The disproportionality is apparent. Some researchers have noted the position that on IQ tests, lower scoring minority groups have unique cultural traits that render traditional intelligence tests at best meaningless and at worst biased (NRC, 2002, Kush et al. 2001).

In this study, where 32.8 percent of the students were black and 64.1 percent were white, no significant differences were found between black or white students on any of the four PASS processes or the Full Scale score. This data is preliminary but it suggests that if tests such as the CAS and scores such as the PASS processes used to aid identification of students with ED, the results may provide an unbiased measure. Further, the data may provide information that would aid in a problem solving approach to intervention.
Limitations

As with nearly all research, limitations of the findings exist which originate from both the sample group and the research method. The following limitations should be considered when interpreting and generalizing the findings.

The subjects selected for this study were used because of convenience and were not randomly selected. From the districts students were sampled, only ED subjects who had been given the CAS were used. This accounted for only a small percentage of the ED students in each district.

CAS administration was not controlled for each subject. A total of seven different trained school psychologists administered the CAS in varying conditions. Administration was not monitored and variation in training between school psychologists is likely to exist.

Matching characteristics provided some instability in the study. For age, students were matched by year rather than by month. This could provide some variation within matched subjects as, theoretically, one student could be 11 months older or younger than his match. SES for the ED sample was identified and grouped into two groups by their free lunch status. Non-ED students’ SES were identified by their parent’s educational level, which included four levels for CAS standardization, and then grouped into two groups. These identifiers and groupings, although providing a reasonable and added match characteristic, may not be equivocable.

Finally, the identification of ED students, although following state and federal guidelines, contributes substantial variation between students. Each ED student is likely
to have had a completely unique group of individuals determine the student's eligibility for identification. Each unique group had the potential to have interpreted the definition of ED differently and thus chosen to identify each student on slightly different criteria.

**Future Research**

To better support the findings here, replication of this study with a larger sample and with more randomized selection and precise matching procedures is suggested. Randomly selecting a large sample of ED students to directly administer the CAS under controlled conditions and closely matching those subjects to controls on the exact same demographics is suggested. A larger sample may also provide opportunity for a broader sampling, comparable to the CAS standardization sample, of race.

Future studies that incorporate a behavior rating scale such as the Devereux Scales of Mental Disorders (Naglieri, LeBuffé, & Pfeifer, 1994) or the Behavior Assessment System for Children (Reynolds & Kamphaus, 1992) for each student and use of the full, 12-subtests CAS Standard battery would be ideal. Adding measures or cases by case analysis of other, environmental factors which impact student performance and behavior, for each group would be informative.

Also useful would be the random comparison of various groups to each other and controls. For instance, comparing groups of non-disabled students to ED and learning disabled students could provide insight into subtle differences between groups.

A question remains for this and other similar studies as to why certain subjects did not follow the pattern of low Planning in the ED group and why do some students have low Planning scores yet not show ED characteristics. Specific investigation into these
cases, including demographic, cultural, family, socio-developmental, and other factors may provide important details to determine which factors significantly influence ED.

Lastly, study on the effectiveness of interventions designed for ED students and based upon their PASS weaknesses is vital. Current research into interventions based on cognitive processing abilities is promising but limited (Naglieri, 2002).

Conclusion

In summary, students identified as ED showed significantly lower CAS Full Scale, Planning, and Attention scale scores than a comparable group of non-ED students. The Planning Scale was the best predictor of group membership with a moderate accuracy of 65.6 percent. This study improved on others by using a matched control group, larger sample size, and larger number of matching variables. Major limitations of the study include non-random subject selection and uncontrolled CAS administration. These results have implications for further research and potential practical application for school personnel.
REFERENCES


