AMERICAN JOURNAL OF

PSYCHOLOGICAL RESEARCH

Volume 1, Number 1
Submitted: September 8, 2004
First Revision: January 14, 2005
Accepted: January 16, 2005
Publication Date: January 20, 2005

RELATIONSHIPS BETWEEN THE COGNITIVE ASSESSMENT SYSTEM AND WRITING ACHIEVEMENT IN STUDENTS WITH AND WITHOUT WRITING DISABILITIES

Judy A. Johnson, University of Houston-Victoria
Achilles N. Bardos, University of Northern Colorado
Kandi A. Tayebi, Sam Houston State University

ABSTRACT

The purpose of this study was to explore the relationships between the PASS model of intelligence and writing achievement in junior high students (aged 11-15 years) with and without written expression disabilities (as determined by school records and achievement testing). The PASS model of intelligence was operationalized as the Das-Naglieri: Cognitive Assessment System (CAS; 1997). Ninety-six students with (n=48) and without (n=48) written expression disabilities were administered the CAS and the writing subtests of the Wechsler Individual Achievement Test (WIAT; 1992). Pearson correlation coefficients were computed to explore the relationships between the two measures. Significant positive correlations were found between the Planning and Attention composites of the CAS and the WIAT writing scales for the students with writing disabilities. In contrast, the Simultaneous and Successive composites of the CAS had significant, positive correlations to writing achievement for the students without writing disabilities.

INTRODUCTION

Writing is considered one of the most challenging skills that youths will master while in school (De La Paz & Graham, 2002). This difficulty is reflected in data from the National Assessment of Educational Progress (Greenwald, Persky, Campbell, & Mazzeo, 1999) where only 25% of each grade level performed at or above the proficient level. Problems in writing begin early and often follow students throughout their educational career (Baker, Gerstein, & Graham, 2003). Writing problems, which often coexist with reading problems, are the reason for many referrals for evaluation in the schools and, later, placement in remedial programs. Students with learning disabilities (LD) in writing often fail to organize and plan their writing (Baker et al., 2003).

Planning is a key component of effective writing (Troia & Graham, 2002). Skilled writers spend much of their time planning the content of their writing. In the last 20 years, several models of the mental processes underlying skilled writing have emphasized the importance of planning in writing (Graham & Harris, 2002; Hayes, 1996; Hayes & Flower, 1986; Scardamalia & Bereiter, 1986). These models of writing influenced the writing research which changed from a focus on the products of writing to the processes of writing (Wong, Wong & Blenkinsop, 1989). From this perspective, the cognitive writing processes of planning, translating and revision became the important focus (Hayes, 1996). Much intervention research with students with learning disabilities in writing has focused on these elements in recent years (De La Paz, 1997).

With the reauthorization of the Individuals with Disabilities Act in 2004, the use of an intelligence test is no longer required when evaluating a student with a suspected learning disability. This change has reignited the controversy among researchers and practitioners; however, this controversy is not new. What is the role of intelligence and intelligence assessment in LD? Siegel (1989) stated that intelligence should not be considered in determining LD; while Naglieri and Reardon (1993) argued that different IQ measures may be more sensitive to measuring the intellectual differences in those with LD. Naglieri and Das (1990) argued that traditional IQ tests have too narrow a view of intelligence and thus neglect many aspects of cognitive functioning. Unlike many intelligence tests, the Cognitive Assessment System (CAS, 1997), based on the Planning-Attention-Simultaneous-Successive (PASS) theory, includes measures of planning and attention processes. Since planning is a key component in the writing process, the present study will examine relationships between writing achievement and the Cognitive Assessment System in youth with and without writing disabilities.

Pass Theory

The PASS theory has developed through empirical and theoretical research over the past several decades. The theory was first described as an information processing model influenced by Luria's work (Das, Kirby, & Jarman, 1975). A. R. Luria proposed that cognitive processing involves three functional units that work together (Luria, 1966, 1980). The first unit, which is needed for effective mental activity, maintains a state of arousal or focus of attention. The second functional unit receives, processes, and retains information and is composed of successive and simultaneous processing. The third unit involves forming plans, carrying them out, and evaluating whether they were effective.

Next, the theory was known as the Information-Integration model (Das, Kirby, & Jarman, 1979) and currently as the PASS theory (Naglieri & Das, 1988). The PASS theory views human cognitive functioning as four basic psychological processes that include planning, attention, simultaneous, and successive processing (Naglieri & Das, 1997). Planning processes provide cognitive control, utilize knowledge, and allow self-regulation to achieve desired goals, while attentional processes provide selective, focused cognitive application over a period of time (Naglieri & Das, 1997). In addition, the simultaneous and successive processes are "the two forms of operating on information" (Naglieri & Das, 1997, p. 2).

PASS Theory and Written Expression

There has been limited research examining the relationship of the PASS processes and writing achievement. Ashman (1978) found that planned composition was correlated with other planning tasks. Ashman's study was one of the earliest studies to include measures of planning based on the theory. This study helped form the initial hypothesis that planning skills in the PASS theory are related to writing achievement. Several years later, Flanagan (1992) found that planning tasks were the best predictor of punctuation, capitalization and written composition achievement in elementary youths referred for learning problems. Further, three studies are mentioned in the Cognitive Assessment System Interpretive Handbook that involve relationships between the CAS and writing achievement (Naglieri & Das, 1997). Naglieri and Rojahn (2004) examined correlations between the CAS and academic achievement utilizing the CAS standardization sample. They found moderate correlations between the Woodcock-Johnson Tests of Achievement—Revised writing subtests of Dictation (.50), Proofing (.44), as well as the Basic Writing Skills composite (.51) and the CAS.

The above studies, although limited in number, have shown a relation between the Planning Scale of the CAS and writing in both students with learning problems (Das & Naglieri, 1997; Flanagan, 1992) and average achievement (Ashman, 1978; Das & Naglieri, 1997; Naglieri and Rojahn, 2004). Additional research is needed to directly assess the hypothesis that students' writing achievement will be significantly related to CAS planning measures. Low planning scores in those with writing disabilities have been observed in the limited research available using experimental, standardization, and the current edition of the CAS. Below, the methods section will describe the present study which addresses whether the below average writing achievement of those with LD is correlated to low scores on CAS planning measures.

METHOD

Participants

Ninety-six junior high school students (enrolled in grades 6, 7, and 8) from a school district in Southeast Texas participated in the study following the signing of appropriate parental consent and individual assent forms. Forty-eight of the students were previously identified with learning disabilities (LD), while 48 of the students were receiving instruction in the regular classroom, were not placed in special education, and served as the control group. Students were selected from school rosters on a voluntary basis and received a small incentive ($5 gift card).

Students labeled "with LD" in this study were current junior high students (grades six, seven and eight) with identification by the school district as LD. Students met the Texas

Education Agency's criteria for eligibility as a student with LD. This eligibility (method one) states that there must be more than one standard deviation between measured intelligence and achievement using norm referenced measures; specific measures are not mentioned in the method 1 criteria for the Texas Education Agency. The student's measured intelligence was also above the range for mental retardation (IQ above 71) on the intelligence measure when eligibility was determined. In addition to Texas Education Agency's criteria, students were required to score below 85 on the Written Expression subtest of the WIAT to be included in the group with LD in this study. These criteria were used to ensure that students had below average achievement compared to their peers, rather than those whose scores fell in the average range. Students were ruled out who had other special education classifications or disabilities such as traumatic brain injuries, Attention Deficit Hyperactivity Disorder (ADHD), emotional disturbance, autism, hearing impairments or visual impairments. Further, the student had to have English selected as the dominant language spoken in the home.

To be included in the group "without LD," the student was required to be a junior high student who received a "B" or better in his or her language arts class; these grade criteria were used to rule out students who may have undiagnosed learning disabilities. The student was also required to score 85 or higher on the WIAT Written Expression subtest to be included in the study. In addition, the student was not receiving special education services in any disability classification and had to have English selected as the dominant language on a survey of the language spoken in the home. The students' parents completed this survey when they enrolled in school.

It was expected that using this criteria to distinguish students with LD from those without LD, would result in a restricted range of test scores. Statistical adjustments were planned to correct for this restriction of range in the present study.

Materials

The Standard CAS battery was administered individually, while the WIAT writing subtests were administered in small groups. The average time for testing was approximately two hours; a licensed school psychologist with graduate training in psychological assessment administered all assessments. The two measures are described in more detail below:

The Wechsler Individual Achievement Test (WIAT)

Past research has shown that finding reliable written expression measures is challenging (Muenz, Ouchi, & Cole, 1999). The WIAT Written Expression subtest was chosen because research has found the WIAT scoring system to have adequate item validity and reliability on most items (Muenz, Ouchi, & Cole, 1999). Further, the WIAT Written Expression subtest allows the student to write for a more extended period of time, rather than writing a few sentences describing a picture. This measure will provide more data on a student's ability to plan and organize an essay.

The WIAT is an individually administered achievement test for ages 5-19 years that was published in 1992 (WIAT, 1992). The WIAT was standardized on 4,252 children who ranged in age from 5 through 19 years. The test yields 8 subtest scores in the areas of Basic Reading, Mathematics Reasoning, Numerical Operations, Spelling, Written Expression, Reading

Comprehension, Listening Comprehension and Oral Expression. For the purposes of this study, only the writing subtests of Written Expression and Spelling were administered. In addition, the two writing subtests were combined as detailed in the WIAT administration and scoring manual (1992) to create a writing composite. The WIAT yields standard scores with a mean of 100 and a standard deviation of 15. The two writing subtests are described below:

The Spelling subtest of the WIAT is designed to measure the student's ability to write letters of the alphabet that are dictated to the student, as well as the ability to encode the dictated sounds into words (WIAT Manual, 1992). The Spelling test is administered orally to the student and has a basal of five consecutive correct responses and a ceiling of six consecutive incorrect responses. The total raw score is converted to a standard score. The average reliability coefficient (age-based) of the WIAT Spelling subtest is .90 (WIAT Manual, 1992).

The WIAT Written Expression subtest requires the student to write for 15 minutes on a topic described in the writing prompt. In this study, the essays were scored using the analytic rating system described in the WIAT manual (1992). Using the analytic scoring system, the essay is rated using a one (poor) to a four (excellent) scale on six element and element groups. The analytic rating system addresses the following areas: Capitalization and Punctuation; Grammar and Usage; Sentence Structure and Variety; Vocabulary; Organization, Unity and Coherence; and Ideas and Development (WIAT Manual, 1992). Average reliability coefficients (age-based) of the WIAT Written Expression subtests are .81 (WIAT Manual, 1992). In the present study, three raters (DG, LO, PT) rated each essay and an average score for each student was recorded to increase reliability. A Writing Composite score was also computed by combining each student's score on the two writing subtests, as indicated in the WIAT administration and scoring manual (WIAT Manual, 1992).

Das-Naglieri: Cognitive Assessment System

The Cognitive Assessment System (CAS, 1997) is a measure of intellectual ability based on the PASS theory of cognitive processing. The CAS is designed for children aged 5-17 years and the normative sample included 2,200 children. The CAS yields 4 cognitive processing scales (Planning, Attention, Simultaneous, and Successive), a Full Scale score and 12 subtest scores. The Full Scale Score and the cognitive processing scales have a mean of 100 and a standard deviation of 15. The subtest scores have a mean of 10 and a standard deviation of 3. Reliability for the CAS was determined using several methods including the split-half method, the reliability of linear combinations and Fisher's z transformation (Naglieri & Das, 1997); subtest reliabilities (the average for all ages) ranged from .75 to .89, while the composite reliabilities ranged from .88 to .96. Since the CAS is a relatively new test, the test is reviewed in more detail below:

Planning Subtests

The CAS planning subtests include Planned Codes, Matching Numbers and Planned Connections. The CAS planning tasks require the child to create a plan, apply the plan, identify whether the plan meets the original goal, and change the plan as needed (Naglieri & Das, 1997). Each Planning subtest also has a strategy assessment checklist, which is completed on each student by the examiner. The examiner marks the strategies used in completing the planning tasks. The Planned Codes subtest provides a client with codes (XX, OO, XO, OX) which

correspond to specific letters, and he or she then fills in the corresponding codes in the empty boxes. This subtest is a variation of other coding subtests, which have been used to measure planning (Naglieri & Das, 1997). In Matching Numbers, the client identifies and underlines two numbers in a row that are the same. The Matching Numbers subtest has been found to be related to other measures of planning in PASS research (Naglieri & Das, 1988; Naglieri, Prewett, & Bardos, 1989). The Planned Connections subtest requires the client to connect sequential stimuli that appear on a page in an apparent random manner. For example, the easier items require a child to connect a series of numbers in order, while the more difficult items have him or her connect numbers and letters alternately (A to 1, B to 2, etc.). Tasks similar to the Planned Connections subtest, for example, Trailmaking (Reitan & Wolfson, 1992) on the Halstead-Reitan Neuropsychological Test Battery, have been used to evaluate frontal lobe functioning (Ashman & Das, 1980; Naglieri, Prewett, & Bardos, 1989).

Attention Subtests

Subtests of attention in the CAS are measures of selective attention and include Number Detection, Receptive Attention, and Expressive Attention. The Attention subtests of the CAS "require the focus of cognitive activity, detection of a particular stimulus, and inhibition of responses to irrelevant competing stimuli" (Naglieri & Das, 1997, p. 17). The Number Detection subtest requires participants underline specific numbers that occur at the top of the page, while the Receptive Attention subtest has them underline pairs of pictures (younger students) or letters (older students) which are identical in appearance and then identify those with the same name. The Expressive Attention subtest varies by age, but for older participants (8-17), the client reads words, identifies colored shapes, and then must read the color of the word rather than pronouncing the word. For example, the word "blue" may be printed in red ink, and the client would say "red." This subtest is similar to the Stroop Neuropsychological Screening Test (Trenerry et al., 1989).

Simultaneous Processing Subtests

Measures of simultaneous processing in the CAS include Verbal Spatial Relations, Nonverbal Matrices, and Figure Memory. Simultaneous processing subtests of the CAS "require the synthesis of separate elements into an interrelated group using both verbal and nonverbal content" (Naglieri & Das, 1997, p. 21). The Verbal Spatial Relations subtest requires a participant to listen to the question read by the examiner and then to identify the picture that correctly answers the question. The Nonverbal Matrices subtest has the participant examine an abstract pattern and complete the matrix by choosing the best option. The Figure Memory subtest requires the client to examine a figure (for example, a diamond) for 5 seconds and then identify (by tracing in pencil) the initial figure in a more sophisticated design.

Successive Processing Subtests

The CAS Successive processing subtests include Word Series, Sentence Repetition, Sentence Questions (ages 8-17) and Speech Rate (ages 5-7). The Successive processing subtests included in the CAS were developed to deal with a serial organization of events. All the successive subtests require the individual to work cognitively with information that is presented in a specific order; this order is most important to the task (Naglieri & Das, 1997). The Word Series subtest requires the student to repeat words in the same order as read by the test examiner (it varies from two to nine words). The Sentence Repetition subtest requires the participant to

repeat each sentence exactly as it was presented. The sentence has color words in place of nouns and verbs. The Sentence Questions subtest requires the client to answer questions about the sentence. The Speech Rate subtest involves the repeated pronunciation of words in order. The Speech Rate subtest was not used in this study due to the age of the participants.

Procedure

Informational letters and parental consent letters were sent home to the parents/guardians of eligible children. In addition, each participating adolescent signed a consent form prior to assessment. Each participant was told they could stop the testing session at any time without any consequences. Testing took place in a private testing room at each student's school during non-academic class periods.

RESULTS

The data for this study was collected from two schools in Southeast Texas. The sample consisted of 96 participants, 56 females (58%) and 40 males (42%). The participants ranged in age from 11 years, 3 months to 15 years, 2 months. The sample included junior high students in grades six (25%), seven (49%), and eight (26%). Thirty-two of the participants were African-American (34%), 31 were Anglo (32%), 29 were Hispanic (30%), 3 were Asian-American (3%) and 1 was Native American (1%). All participants had English selected as their dominant language. The study included 48 students with LD (50%) and 48 students without LD (50%). The students with LD had previously been evaluated and all had been identified as LD.

Means and standard deviations are reported for both groups in Table 1. The group with LD fell in the low average range on the Planning composite, but scored in the average range on the Attention, Simultaneous and Successive composites. The group without LD scored in the average range on all PASS composites.

Participants were required to score 85 or above on the Written Expression subtest to be included in the group without LD and below 85 to be included in the group with LD. The Written Expression scores ranged from 90 to 131 for the group without LD and from 60 to 84 for the group with LD. The words in each student's WIAT writing sample was counted and the administration time computed. Consistent with the literature (Mather & Roberts, 1995), students with LD wrote fewer words and wrote for fewer minutes than their peers without LD. On average, the group with LD wrote 66 fewer words and wrote for 3 minutes less than the group without LD on the Written Expression subtest. On the WIAT elements of Writing the group with LD scored lower than the group without LD on all elements.

Table 1
Means and Standard Deviations on the CAS Composites and WIAT for Groups with and Without LD

Measure	With LD		Without LD	
	Mean	SD	Mean	SD

Planning Composite	85.56	11.30	106.79	13.78
Attention Composite	93.23	9.96	109.50	14.25
Simultaneous Composite	92.88	10.15	104.50	10.74
Successive Composite	91.98	10.28	99.56	9.25
Written Expression (WE) Subtest	72.19	6.24	109.48	9.83
Spelling Subtest	74.13	9.36	104.35	11.11
Writing Composite	68.98	8.55	106.75	10.57
WE words written	80.90	49.52	147.35	42.19
WE time (in seconds)	454.33	234.96	657.10	124.28

Pearson correlation coefficients were computed on all standard scores. The CAS subtests were highly correlated with the subtests which comprise each composite; this finding was true for both the group with LD and the group without LD when correlations were calculated separately. The Attention composite was highly correlated with the Planning composite. For the group with LD, there was a significant relationship between the Planning and the Attention composite ($r = .60$; $p < .001$), as well as the Attention and Simultaneous composite ($r = .34$; $p < .05$). The only significant correlation for the group without LD was between the Attention and Planning composite ($r = .73$; $p < .001$).

Relationships between the CAS Composites and WIAT writing scales are presented for the group with LD and group without LD in Table 2. The group with LD had significant correlations between the Planning and Attention composites and the WIAT writing scales. The highest correlation with the Written Expression subtest was the Planning composite ($r = .52$; $p < .001$) for the group with LD. Further, the Attention composite had the highest correlation with the Spelling subtest ($r = .51$; $p < .001$) and the WIAT Writing composite ($r = .56$; $p < .001$). In contrast to the group with LD, the group without LD had significant correlations between the Successive and Simultaneous composites and the WIAT Spelling and Writing composite. No significant correlations were found between the CAS composites and the Written Expression subtest for the group without LD. However, the Successive composite had the highest correlation with the WIAT Spelling ($r = .43$; $p < .01$) and Writing composite ($r = .42$; $p < .01$).

A restriction of range was noted for both groups on the WIAT writing subtests. The selection of subjects for the groups with LD and without LD contributed to this restriction of range. A correction for this restriction of range was then computed using the method recommended by Guilford and Fruchter (1978). These values are reported in parentheses on Table 2. After this correction, there were significant correlations between the Planning composite and Written Expression subtest ($r = .63$; $p < .001$), Spelling subtest ($r = .44$; $p < .01$), and Writing Composite ($r = .59$; $p < .001$) for the group with LD. Further, significant correlations were found between the Attention composite and the Written Expression subtest ($r = .64$; $p < .001$), Spelling subtest ($r = .67$; $p < .001$), and Writing Composite ($r = .71$; $p < .001$) for students with LD.

When the correction was computed for the group without LD, several significant relationships were also found between the Simultaneous and Successive composites and the WIAT writing scales. Significant relationships were found between the Simultaneous composite and the Spelling subtest ($r = .52$; $p < .001$) and the Writing composite ($r = .44$; $p < .01$) for those without LD. The Successive composite was significantly correlated with the Written Expression subtest ($r = .42$; $p < .01$), Spelling subtest ($r = .62$; $p < .001$) and Writing composite ($r = .60$; $p < .001$) for those without LD.

Table 2
Correlations between CAS Composites and WIAT Writing Scales for the Group With LD and Without LD

	Planning	Attention	Simultaneous	Successive
With LD				
Written Expression	.52***	.48**	.09	.19
	(.63***)	(.64***)	(.13)	(.27)
Spelling	.35*	.51***	.13	.05
	(.44**)	(.67***)	(.19)	(.07)
Writing Composite	.48**	.56***	.13	.09
	(.59***)	(.71***)	(.19)	(.13)
Without LD				
Written Expression	.12	.07	.08	.27
	(.13)	(.07)	(.11)	(.42**)
Spelling	.21	.19	.40**	.43**
	(.22)	(.20)	(.52***)	(.62***)
Writing Composite	.19	.16	.33*	.42**
	(.21)	(.17)	(.44**)	(.60***)

Note: scores in parentheses have been corrected for restriction of range.
*$p < .05$; **$p < .01$; ***$p<.001$

DISCUSSION

The present study added to the research assessing the PASS theory in students who have written expression disabilities. Most of the early research on the PASS theory has been done with students with reading and math disabilities (Das, Naglieri, & Kirby, 1994). The findings of the present study were consistent with two other studies (Ashman, 1978; Flanagan, 1992) which found relationships between the Planning scale and written expression. However, in the above studies, an experimental set of PASS tasks were used. The present study is one of the first studies to compare the current version of the CAS in students with and without written expression disabilities. Naglieri and Rojahn (2004) found moderate correlations between writing achievement and the CAS planning scores using data from the CAS standardization sample. The other studies that examined the relationships between the CAS and writing took place as part of

the standardization of the test. In these studies, as well as in the present study, researchers found relationships between the Planning composite and writing achievement. The present study extended the research that states students who have writing disabilities have depressed scores on the Planning composite. This finding may be interpreted as indicating that difficulties in some aspects of writing may be due to poor planning processes. Additionally, the Attention composite was significantly related to the writing achievement of students with LD; the Planning and Attention composites have been found to be significantly correlated in past research (Keith, Kranzler, & Flanagan, 2001; Kranzler, Keith, & Flanagan, 2000).

The addition of the CAS to an assessment battery for a student with a suspected disability will yield additional information not contained in traditional IQ tests. The most commonly used IQ tests do not directly measure planning or attention processes. The CAS appeared to be sensitive to the cognitive differences of students with LD in the present study. Of course, discovering that a learning disability exists in a specific academic area is only the beginning. Assessment data is most useful when it can be linked to an effective intervention that may remediate the cognitive deficit found through testing (Das et al., 1994). An important goal of those who promote the use of the CAS is to use the cognitive processing information to make decisions about instructional programming (Naglieri & Das, 1997). Recent research has studied how to link the CAS data to intervention planning with specific students (Haddad et al., 2003; Kroesbergen, Van Luit, & Naglieri, 2003; Naglieri & Das, 1997; Naglieri & Johnson, 2000).

A recent intervention study examined whether instruction to facilitate planning would be impacted by specific PASS cognitive profiles of the participants (Naglieri & Johnson, 2000). It was found that children with cognitive weaknesses in Planning gained the most benefit from the instruction that focused on planning facilitation. While this study was completed with students who had difficulties in mathematics, the same concept could be applied to those with writing disabilities. If further studies replicate the findings in the present study, interventions to remediate planning deficits (as recognized by CAS assessment) in students with written expression disabilities may be warranted.

De La Paz (1997, p. 245) stated, "literature now exists in which the advantages of teaching students with and without learning disabilities strategies to plan (setting process and content goals, using text structure to generate writing content) before composing are well known." These studies have shown positive results in improving the quantity of writing, and often the quality of the writing of students with LD. Students with LD have been shown to write fewer words and write for less time; this was found to be true for the LD group in the present study as well.

The relationships between the CAS subtests and composites in this study added to the research on the interrelated nature of the PASS components. However, the subtests always correlated most highly with their respective composite. This study also found a high correlation between the Planning and Attention composites and subtests; this is consistent with other recent research with the CAS (Keith, et al., 2001; Kranzler et al., 2000). During test development of the CAS, confirmatory and exploratory factor analyses were utilized to examine the underlying structure of the CAS (Naglieri & Das, 1997). Support for both a three-factor solution and a four-factor solution was found through factor analysis. Specifically, the factor solution hinged on

whether the Planning and Attention scales should be separated or combined. However, the four-factor solution was chosen because it was more consistent with empirical, theoretical and clinical information (Naglieri, 1999). The works of Luria (1966, 1980) described the close functional and structural relationship between the processes of attention and planning.

There are several limitations in the present study. The limitations include the characteristics of the sample, criteria to determine students with and without LD, and validity and reliability of the instruments. These limitations are discussed in the paragraphs below:

The sample in the present study was voluntary, and thus, the performance of the students with and without writing disabilities may differ from that of the typical children in this age range. The generalizability of the findings needs to be evaluated in regards to this fact. The group without LD was also restricted to students who received an "A" or "B" in their language arts class and were selected by his or her language teacher. This restriction impacted the writing skills of those in the group without LD. However, this was done to rule out students who may have undiagnosed learning disabilities in writing.

Another limitation is the definition used to define "LD" in the present study. Different states use different criteria to determine if a student is LD in written expression. Students selected in this study met the Texas Education Agency's criteria for a learning disability (method 1). However, states develop their criteria for LD from federal guidelines, so there should be many similarities. The present study also required those with LD to score below 85 on the Written Expression subtest of the WIAT. Another limitation of the study is that the quality of the data attained in the present study is related to the instruments used in the study. The results of the present study must be interpreted in regards to the reliability and validity of the instruments used to measure cognitive processing and writing achievement.

The Cognitive Assessment System shows promise as an assessment instrument that will identify cognitive processing strengths and weaknesses, and may lead to the development of programs to remediate cognitive processing deficits that result in poor academic achievement. Preliminary results of PASS intervention programs have been encouraging. Although additional research is needed, results of the present study support the use of the PASS theory of cognitive processing, operationalized in the CAS, to evaluate students who have written expression disabilities. Future research should continue to explore whether linking the assessment results of the CAS to academic interventions results in increased achievement for students.

REFERENCES

Ashman, A. (1978). *The relationship between planning and simultaneous and successive synthesis. Unpublished doctoral dissertation,* University of Alberta, Edmonton.

Ashman, A., & Das, J. P. (1980). Relation between planning and simultaneous-successive processing. *Perceptual and Motor Skills, 51*, 371-382.

Baker, S., Gersten, R., & Graham, S. (2003). Teaching expressive writing to students with learning disabilities: Research-based applications and examples. *Journal of Learning Disabilities, 36(2),* 109-124.

Berninger, V. (1999, April). *Planning, implementing, and evaluating writing interventions*. Paper presented at the meeting of the National Association of School Psychologists, Las Vegas, NV.

Das, J. P., Kirby, J. R., & Jarman, R. F. (1975). Simultaneous and successive synthesis: An alternative model. *Psychological Bulletin, 82*, 87-103.

Das, J. P., Kirby, J. R., & Jarman, R. F. (1979). *Simultaneous and successive cognitive processes*. New York: Academic Press.

Das, J. P., & Naglieri, J. A. (1997). *Das-Naglieri: Cognitive Assessment System*. Chicago: Riverside Publishing.

Das, J. P., Naglieri, J. A., & Kirby, J. R. (1994). *Assessment of cognitive processes: The PASS theory of intelligence*. Boston: Allyn & Bacon.

De La Paz, S. (1997). Strategy instruction in planning: Teaching students with learning and writing disabilities to compose persuasive and expository essays. *Learning Disability Quarterly, 20*, 227-248.

De La Paz, S., & Graham, S. (2002). Explicitly teaching strategies, skills, and knowledge: Writing instruction in middle school classrooms. *Journal of Educational Psychology, 94(4)*, 687-698.

Flanagan, D. P. (1992). *The planning, attention, simultaneous, and successive (PASS) model of cognitive processing and its relationship to academic achievement.* Unpublished doctoral dissertation, Ohio State University, Columbus, Ohio.

Graham, S., & Harris, K. R. (2002). Literacy: Writing. In L. Nadel (Ed.), *Encyclopedia of Cognitive Sciences*. London: Palgrave Macmillan.

Greenwald, E., Persky, H., Campbell, J., & Mazzeo, J. (1999). *National assessment of educational progress: 1998 writing report card for the nation and the states*. Washington, DC: U. S. Department of Education.

Guilford, J. P., & Fruchter, B. (1978). *Fundamental statistics in psychology and education*. New York: McGraw-Hill.

Haddad, F. A., Garcia, Y., Naglieri, J., Grimditch, M., McAndrews, A., & Eubanks, J. (2003). Planning facilitation and reading comprehension: Instructional relevance of the PASS theory. *Journal of Psychoeducational Assessment, 21(3)*, 282-289.

Hayes, J. R. (1996). A new framework for understanding cognition and affect in writing. In M. Levy and S. Ransdell, (Eds.), *The Science of Writing: Theories, Methods, Individual Differences and Applications* (pp. 1-27). Mahwah, NJ: Lawrence Erlbaum.

Hayes, J. R., & Flower, L. (1986). Writing research and the writer. *American Psychologist, 41*, 1106-1113.

Keith, T. , Kranzler, J. , & Flanagan, D. (2001). What does the Cognitive Assessment System (CAS) measure? Joint confirmatory factor analysis of the CAS and the Woodcock-Johnson Tests of Cognitive Ability (3rd edition). *School Psychology Review, 30*, 89-119.

Kranzler, J. , Keith, T., & Flanagan, D. (2000). Independent examination of the factor structure of the Cognitive Assessment System (CAS): Further evidence challenging the construct validity of the CAS. *Journal of Psychoeducational Assessment, 18*, 143-159.

Kroesbergen, E., Van Luit, J., & Naglieri, J. A. (2003). Mathematical learning difficulties and PASS cognitive processes. *Journal of Learning Disabilities, 36(6)*, 574-582.

Luria, A. R. (1966). *Human brain and psychological processes*. New York: Harper & Row.

Luria, A. R. (1980). *Higher cortical functions in man.* (2nd ed.). New York: Basic Books.

Mather, N., & Roberts, R. (1995). *Informal assessment and instruction in written language: A practitioner's guide for students with learning disabilities*. New York: John Wiley and Sons.

Muenz, T., Ouchi, B., & Cole, J. (1999). Item analysis of written expression scoring systems from the PIAT-R and WIAT. *Psychology in the Schools, 36*, 31-40.

Naglieri, J. A. (1999). How valid is the PASS theory and CAS? *School Psychology Review, 28 (1),* 145-162.

Naglieri, J. A., & Das, J. P. (1988). Planning-arousal-simultaneous-successive (PASS): A model for assessment. *Journal of School Psychology, 26*, 35-48.

Naglieri, J. A. & Das, J. P. (1990). Planning-attention-simultaneous-successive cognitive processes as a model for intelligence. *Journal of Psychoeducational Assessment, 8*, 303-337.

Naglieri, J. A., & Das, J. P. (1997). *Das-Naglieri Cognitive Assessment System interpretive handbook.* Itasca, IL: Riverside Publishing.

Naglieri, J. A., & Johnson, D. (2000). Effectiveness of a cognitive strategy intervention in improving arithmetic computation based on the PASS theory. *Journal of Learning Disabilities, 33*, 591-597.

Naglieri, J. A., Prewett, P., & Bardos, A. N. (1989). An exploratory study of planning, attention, simultaneous, and successive cognitive processes. *Journal of School Psychology, 27*, 347-364.

Naglieri, J. A., & Reardon, S. M. (1993). Traditional IQ is irrelevant to learning disabilities—intelligence is not. *Journal of Learning Disabilities, 26(2),* 127-133.

Naglieri, J. A., & Rojahn, J. (2004). Construct validity of the PASS theory and CAS: Correlations with achievement. *Journal of Educational Psychology, 96(1),* 174-181.

Reitan, R. M., & Wolfson, D. (1992). *Neuropsychological evaluation of older children*. South Tucson, Arizona: Neuropsychology Press.

Scardamalia, M., & Bereiter, C. (1986). Written composition. In M Wittrock (Ed.), *Handbook on research on teaching* (3rd ed., pp.778-803). New York: Macmillan.

Siegel, L. S. (1989). IQ is irrelevant to the definition of learning disabilities. *Journal of Learning Disabilities, 8*, 469-478.

Troia, G. A., & Graham, S. (2002). The effectiveness of a highly explicit, teacher-directed strategy instruction routine. *Journal of Learning Disabilities, 35*, 290-305.

Trenerry, M. R., Crosson, B., DeBoe, J, & Leber, W. (1989). *Stroop Neuropsychological Screening Test.* Lutz, FL: PAR.

Wechsler Individual Achievement Test. (1992). San Antonio, TX: The Psychological Corporation.

Wong, B., Wong, R., & Blenkinsop, J. (1989). Cognitive and metacognitive aspects of learning disabled adolescents' composing problems. *Learning Disability Quarterly, 12 (4),* 300-322.

Wong, B., Butler, D., Ficzere, S., & Kuperis, S. (1996). Teaching low achievers and students with learning disabilities to plan, write, and revise opinion essays. *Journal of Learning Disabilities, 29 (2),* 197-212.