

The Impact of Verbal Fluency Skills on Writing: A Comparison of Fifth-Grade Students with Learning Disabilities and Students with Typical Development

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Abstract: *The relationship between verbal fluency skills and writing skills in developing writers was explored in a sample of fifth-grade students: 30 students with an identified learning disability (LD) in written language; 30 typically developing students (TD). The relationship between scores on three D-KEFS Verbal Fluency Tests and the composite writing score on the State Fifth-Grade Writing Assessment was explored. The results showed that for students with a LD, two D-KEFS tests were significantly correlated with the composite writing score. For students with TD, there were no statistically significant correlations. These findings suggested that verbal fluency skills have more of a relation to writing skills for students with LD than for students with TD. Research significance of findings is discussed.*

Keywords: *Learning Disabilities, Verbal Fluency, Writing*

Research has demonstrated that not only is writing difficult for children with an identified Learning Disability (LD) (Graham & Harris, 2003; Saddler, 2006; Troia, 2006), writing has also been shown to be difficult for students in the general education population as well (Catts & Kamhi, 2005; Harris, Graham, & Mason, 2003; Hooper & Montgomery, 1993). In a study of 139,000 fourth-grade special education and general education students across the United States, the National Center for Education Statistics (U.S. Department of Education, 2003) reported that in 2002 only about 28% of fourth graders wrote at a proficient level or above, 58% wrote at a basic level, 14% wrote below the basic level, and only 2% of students wrote at an advanced level. Writing therefore appears to be a difficult task for most elementary school students to master.

Even though writing has been shown to be difficult for many students to master, writing is essential for communication. Writing has been identified as a key type of communication (Catts & Kamhi, 2005; Graham, MacArthur & Fitzgerald, 2007). It could be construed as a social interactive process that is fundamentally an interaction of the minds of the writer and reader (Nystrand, 1989). Writing is also described as a learning tool. That is, by writing about a topic, one comes to understand the topic in a different or deeper way (Bereiter & Scardamalia, 1987; Hansen, 2001). When students learn to write, especially in the expository and argument (persuasion) genres, they acquire new

avenues of making meaning of what they have learned (Catts & Kamhi, 2005; Feifer & De Fina, 2002). In other words, writing is a critical skill necessary for school success.

There are numerous ways in which the practice of writing benefits students. For example, writing can put one in touch with one's own thoughts by writing in personal journals and diaries and is a means to demonstrate creativity such as with stories or narratives. Also, writing is a method to share information or explain something like how to ride a horse or clarify why one likes to swim (Temple, Nathan, Temple, & Burris, 1993). Graves (1985) described writing as a communication tool in which people impart information to others and themselves. Graves noted that when writing his thoughts on paper, he "writes to learn what I know because I don't know fully what I mean until I order the words on paper" (p. 171). Thus, writing is a tool to clarify, categorize, and expand one's thoughts. Similarly, in the classroom, writing is a way for students to synthesize (e.g., organize, explore, refine) their ideas about a subject matter as well as demonstrate their knowledge about a particular area in order to achieve mastery (Graham & Harris, 2005).

WRITING DIFFICULTIES FOR STUDENTS WITH LEARNING DISABILITIES

Good writing skills contribute to academic success for all students. Unfortunately, students with a LD have difficulty with written language skills that is exemplified by writing that lacks development and is generally condensed (Graham & Harris, 2003). In writing, the defining characteristics of students with a LD are that they tend to produce written work that is less polished, contains fewer words per composition, is less expansive, has fewer sentences, and provides a more limited vocabulary than typically developing (TD) students (Harris et al., 2003; Newcomer, Barenbaum, & Nodine, 1989; Saddler, 2006; Troia, 2006; Vallecorsa & Garriss, 1991).

One of the underlying difficulties with writing that students with a LD have is a lack of knowledge of the writing process. This knowledge deficiency can be manifested by little or no planning prior to writing. Students with a LD usually rely on a composing process in which they generate words to put on paper. Students with a LD retrieve from their memory a pertinent idea, write it down, and use each preceding phrase or sentence to stimulate the next idea. For example, when asked to write an essay, "What would happen if children ruled the world," a student with a LD may write, "I would like to rule the world. It would be fun. My sister wouldn't be good at ruling the world. I think I would be good at ruling the world." Little effort is made to evaluate or revise these ideas or to consider the constraints imposed by the topic, the needs of the audience, or the organization of the text. The resulting composition is generally a list of topic-related ideas rather than a coherent discussion or examination of the topic (Graham & Harris, 2003). Consequently, the planning and composing procedure for students with a LD is dominated by an unorganized content generation process, which in turn is relatively unproductive. Their papers are extremely short and contain little elaboration or detail (Graham, Harris, MacArthur, & Schwartz, 1991). In addition to having difficulty with higher level composing skills of organization, revising, and generating text, children with a LD also have difficulty with the lower-level skills of spelling, punctuation and grammar (Catts & Kamhi, 2005). In summary, students with a LD often have significant difficulty with writing skills which is often manifested by writing that is unorganized, minimal in length, and contains spelling, punctuation, and grammar errors.

EXECUTIVE FUNCTIONING SKILLS INVOLVED WRITING

Intact executive functioning skills are an integral part of the writing process. Executive functioning skills are cognitive processes that involve goal-directed activities (Meltzer, 2007). Essentially, executive functioning skills are control or managerial processes that involve reciprocal interaction with other cognitive domains, such as attention and memory (Denckla, 2005).

The act of writing requires cognitive managerial processes that will direct the interrelated skills of thought, processing, and production (Feifer & Fina, 2002). Moreover, writing is more of an executive functioning skill than other skills (e.g., reading, math) because it requires formulating ideas, organizing the ideas into sentences and paragraphs, using words to convey meaning and link ideas, using graphomotor skills to write and spell words, evaluating the accuracy of the output, and editing as needed (Berninger, 2002; Feifer & De Fina, 2002; Hale & Fiorello, 2004). For these reasons, it is the high levels of executive functioning skills required that set written language apart from all other achievement activities (Feifer & De Fina, 2002; Hale & Fiorello).

SUCCESSFUL EXECUTIVE FUNCTIONING WRITING STRATEGIES

Hayes and Flower (1980) proposed an influential theory of cognitive skills involved in composing. The model focuses on the higher level cognitive and linguistic processes involved in writing, and consists of three recursive processes: (1) Planning: making a plan about the writing assignment; (2) Translating: putting words on paper; (3) Reviewing: improving the quality of the written product. Using the Hayes and Flower seminal model as an example of the processes involved in writing, the following research has demonstrated success with strategy instruction, which explicitly and directly teaches planning, transcription, and revising skills (De la Paz, 1999; Graham & Harris, 2007).

Planning strategies. Planning has been defined as generating ideas, organizing the text, and setting goals (Berninger, Fuller, & Whitaker, 1996). Expert writers plan by formulating goals for their texts (e.g., to address a particular audience, to write with a specific voice) and developing plans to achieve the goals (e.g., language to be used in the discourse; McCutchen, 2006). Mature writers often mix planning with text production (Hayes & Flower, 1980). The mature writers switch back and forth between planning and production, and both complement each other.

Text production strategies. The Hayes and Flower model (1980) places the act of generating ideas in the planning phase. That is, the writer may jot down words, phrases, and incomplete sentences to form ideas for the organization of the paper. Adjacent to the planning phase is the translating phase. Hayes and Flower stated that part of the translating process is to take the material generated in the planning phase and turn it into satisfactory sentences. Translating, as text generation has been described, is transforming ideas into the language of words, sentences, and paragraphs (Berninger et al., 1992).

Because of the importance of the skill of writing well-crafted sentences, direct, systematic instruction has been shown beneficial for students who have difficulty writing (Saddler, 2007). In a study that used peer-assisted strategy along with sentence combining instruction, Saddler and Graham (2005) demonstrated the benefits of specific instruction in producing complex sentences. The participants were 44 fourth-grade students who were determined to be either a “skilled writer” or a “less skilled writer” as

a result of their score on two subtests of the Test of Written Language-3 (TOWL-3; Hammill & Larsen, 1996). The students were randomly assigned to either the experimental group (sentence-combining) or control group (grammar instruction). In each group, a less skilled writer was paired with a skilled writer. Each student group received 30 lessons, 25 min long, three times per week for 10 weeks. For the experimental group, the lessons consisted of instruction in the following: combining related sentences into compound sentences using a connector, taking two similar sentences and combining them into one sentence while embedding an adjective or adverb (e.g., "The soup is hot" "The soup is green" combined to "The green soup is hot," creating complex sentences by embedding an adverbial and adjectival clause, respectively, from one sentence into the other (e.g., "The students all cheered" and "The movie stopped" combined to "They all cheered when the movie stopped,"), and making multiple embedding's involving adjectives, adverbs, adverbial clauses and adjectival clauses. The students in the control group received instruction in grammar skills with lessons on the following specific parts of speech: verbs, nouns, adjectives, adverbs and subjects and predicates. The researchers found that students in the sentence-combining group improved in their ability to produce a correctly written sentence and in their overall writing quality.

Revising strategies. Revision is a complex process that has distinct task demands (Bartlett, 1982). To revise a text, a writer must use reading comprehension skills in order to identify problems, such as disjointed meaning of the text and incorrect conventions, and to improve the text overall (Bartlett; Hayes & Flower, 1980; MacArthur, 2007). Teachers can assist beginning writers in acquiring the skills needed to revise by teaching the direct skills involved in the revising process (Gould, 2001; MacArthur). In one study (Graham, MacArthur, & Schwartz, 1995), researchers randomly assigned 67 fourth-through sixth-grade students from six self-contained classrooms for students with LD into one of three groups: (1) *General-Goal Condition*: Students were told to revise their paper to "make it better," (2) *Goal-To-Add-Information*: Students were told to add at least three things to their papers to make them better, (3) *Goal-To-Add-Information Plus-Procedural-Facilitation*: Students were given a specific goal to add at least three things to make their paper better. In addition they were directed to use the following procedure that was first modeled: (a) Students were asked to write on a separate piece of paper at least five things they could add to their story; (b) students were encouraged to "try to think of as many things as you can" including things that happened, descriptions of things, or details; and (c) students then evaluated their possible additions and made a check next to the three that would best help their story.

For all conditions, the students were offered two story prompts and told to write a narrative from one of the prompts. The students wrote the first draft and then revised the draft two to four days later. Prior to scoring the stories, all compositions were typed on a word processor, including all errors, and all identifying information was replaced with a code. The scorers were blind to condition and rated the stories on quality, length, and revisions (Graham et al., 1995).

As predicted, the students in Group 1 showed little or no corresponding improvement in the quality of the text. Over 70% of their revisions involved changes in capitalization, punctuation, spelling, or format. Only 16% of their revisions resulted in changes in meaning. The researchers noted that revising had little effect on improving the overall quality of the papers. The researchers further predicted that Group 2 would make more meaning-changing revisions than Group 1, and this theory proved to be true.

However, the researchers reported that changes in the quality of their papers were modest in this group. Moreover, the majority of revisions did not make a positive change in the substance of the text. That is, meaning-changing revisions were outnumbered by meaning-preserving revisions. Lastly, the researchers predicted that Group 3 would make greater improvements in the quality than the first two groups, and this was found not to be true. Group 3 made greater improvements over Group 1, but not over Group 2. Another surprise was that length was not significantly affected by the instructional conditions. The researchers suggested that goal setting and procedural facilitation paired with modeling and an executive function method, such as strategy instruction, may be needed to more fully address students revising difficulties (Graham et al., 1995).

In summary, intact linguistic skills are central in the ability to produce cohesive writing. A key feature of linguistic development is the executive functioning skill of verbal fluency. Verbal fluency is defined as the “speed and ease of verbal production” (Lezak, Howieson, & Loring, 2004, p. 518). Measuring verbal fluency typically entails counting the number of words produced within a particular category or in response to a stimulus and often within a specified time limit (Lezak et al., 2004). Even though executive functioning, specifically verbal fluency, plays a vital role in proficient writing, there is a paucity of research on its function, development, or impact on children in elementary school who are learning to write (Graham et al., 2007). Given the complexity of written language, attempts to isolate key areas, where students with a LD struggle, for example verbal fluency, will help educators design individually targeted instructional interventions. Thus, the purpose of this study is to explore the relationship between verbal fluency skills and writing skills in developing writers.

METHOD

Verbal fluency is an executive functioning skill. It was chosen for this study for its influential Hayes and Flower (1980) model of written language. This model posits that writing consists of three recursive writing processes: planning, translating, reviewing. In this model verbal fluency is important because the writing task involves not only planning (generating ideas) but also translating (writing ideas on paper). This project explores the following research question: Is there a relationship between the scores on the D-KEFS Verbal Fluency Test (letter fluency, category fluency, category switching number correct, category switching accuracy) and the scores on the statewide 5th-grade writing proficiency assessment?

PARTICIPANTS

The participants in this study were 30 fifth-grade students with a LD in written language and 30 fifth-grade students with TD from a large school district in a western state. Students from 10 elementary schools in the district were recruited by the experimenter. The students ranged in age from 10 years 7 months to 12 years 1 month (LD: $M=11.11$, $SD=.44$; TD: $M=11.02$, $SD=.43$), and were enrolled in fifth-grade general education and special education classrooms. To build a matched sample, an equal number of students with a LD and TD were identified from each school. The number of students participating in the study in each school ranged from one student in each group to five students. Nearly 50% of the students participating in the study ($n=28$) attended the three schools with the lowest percentages of free and reduced lunch.

All students with a LD in written language met the qualification criteria outlined by the state educational regulations. To qualify for membership in the group of students designated with a LD in written language, students had at least one reading and/or writing goal in their Individualized Educational Plans (IEPs). The group of students with TD were composed of students who were enrolled full-time in a general education classroom and did not receive special education or Section 504 services. Four demographic variables, by school, were obtained from public information published by the State Department of Education (2008b) for the school year 2007-2008, as shown in Tables 1 and 2: school enrollment, students with IEPs, students who qualified for free and reduced lunch (FRL), and student ethnicity.

As shown in Table 1, the number of students enrolled in each elementary school varied from a low of 212 to a high of 799. Most schools had relatively similar percentages of students with IEPs and the percentage of students receiving FRL varied from 6.6 % to 40.6 %.

Table 1. Student Enrollment and School Percentages for IEP and FRL

School	Enrollment	IEP	FRL
1	720	12.6	14.3
2	799	13.9	2.9
3	561	13.4	11.6
4	406	9.1	40.6
5	512	9.0	23.0
6	219	11.9	a
7	427	13.8	29.5
8	574	17.4	22.8
9	656	11.0	30.8
10	212	11.8	6.6

Note. IEP = Individualized Education Plan; FRL = free and reduced lunch. ^aData not presented for groups fewer than 10

Table 2. Ethnicity Percentages for Schools

School	American Indian/Alaskan Native	Asian Pacific Islander	Hispanic	Black	White
1	2.2	8.1	13.3	4.2	72.2
2	1.1	5.1	8.1	3.3	82.4
3	1.6	7.7	11.8	2.5	76.5
4	2.5	5.7	17.7	3.0	71.2
5	2.1	4.9	24.2	2.3	66.4
6	2.7	9.6	15.1	2.3	70.3
7	1.6	8.0	15.7	4.9	69.8
8	1.4	13.1	14.5	4.9	66.2
9	2.0	4.6	31.7	4.9	56.9
10	1.4	7.5	1.9	0.9	88.2

As presented in Table 2, all schools had a large percentage of students who were White, a relatively small percentage of students who were identified as American Indian/Alaskan Native, a relatively equal percentage of students who were Black and

Asian/Pacific Islander (except for one school), and a varied percentage of students who were Hispanic.

MEASURES

There were two instruments used in this study. The tests used were the Delis-Kaplan Executive Function System (D-KEFS; Delis et al., 2001) and the State Proficiency Examination Program (SPEP) Fifth-Grade Writing Assessment. The D-KEFS Verbal Fluency Test measures the student's "ability to generate words fluently in an effortful, phonemic format (letter fluency), from overlearned concepts (category fluency), and while simultaneously shifting between overlearned concepts (category switching)" (Delis et al., p. 55). The D-KEFS was standardized on a nationally representative stratified sample including children ages 8-12. Evidence of the validity of the D-DKEFS has been provided in terms of sensitivity of the test to measure important areas of higher level executive functions. Spreen and Strauss's (1998) text *A Compendium of Neuropsychological Tests* and Lezak's (1995) textbook *Neuropsychological Assessment* provide excellent reviews of the over 50 validity studies.

The SPEP Fifth-Grade Writing Assessment is a district-wide writing assessment that was administered to all fifth-grade students. The test consisted of one writing prompt in which the student wrote an essay in response to the prompt

Verbal fluency. The D-KEFS (Delis et al., 2001) Verbal Fluency Test consisted of three testing conditions: letter fluency, category fluency, and category switching. All testing conditions were administered one-on-one with an examiner in a private room. For example, for the letter fluency condition, the student was asked to generate words that begin with a particular letter as rapidly as possible (e.g., F-fun, fat, funny, fist, fish). There were three letters (F-A-S), and the student was given 60 seconds for each letter. Each correct response was scored as 1. A scaled score was obtained for this condition.

In the category fluency condition, the student was asked to generate words that belong to a designated semantic category as quickly as possible. For this condition, the student had 60 seconds to name items that were animals (e.g., cat, dog, horse, monkey) and 60 seconds to name items that were boys' names (e.g., Juan, Steve, John, Jamaal). Each correct response was scored as 1. A scaled score was obtained for this condition.

The category switching condition asked the student to generate words, alternating between two different semantic categories as quickly as possible. In this condition the participant had 60 seconds to switch back and forth between saying as many fruits and as many pieces of furniture as he/she could verbalize (e.g., orange-chair, apple-table, peach-stool). Each correct item that was named for the designated category was given a score of 1. A scaled score for total correct responses was obtained. A second scaled score for this condition was obtained by totaling the correct category switches.

Internal consistency measures and the test-retest reliability for the D-KEFS were moderately-high to high as shown in Table 3.

State Writing Assessment. The SPEP Fifth-Grade Writing Assessment was administered to all students in the district during the months of January and February 2009. Schools were assigned to a 3-day period either in January 2009 or February 2009 in which to administer the test. The writing reliability coefficient of the test across trait scores for the school years 2006, 2007, 2008 were 0.956, 0.952, 0.942, respectively (A.H. Davidson, State Department of Education, personal communication, March 4, 2009). The test consisted of one writing prompt. An example of a past writing prompt was: "Sometimes we give help, and sometimes we get help. Think of a time when you helped

someone or when someone helped you. Tell a story about what happened” (State Department of Education, 2008c).

Table 3. *The Internal Consistency Reliability and Test-Retest Reliability for the D-KEFS for Ages 10, 11, and 12 Years*

Testing Condition	Age 10	Age 11	Age 12	Test-Retest Reliability
Letter Fluency	.80	.76	.77	.67
Category Fluency	.71	.58	.72	.70
Category Switching	.56	.62	.62	.53

Note: D-KEFS = Delis-Kaplan Executive Function System (Delis et al., 2001).

The test was administered in three sessions by each classroom teacher. However, if a student had an IEP that specified that tests will be taken in a small environment setting, the student took the test with a special education teacher in a small class setting. Each teacher was given a test administration manual and instructions to follow the script verbatim. Each writing session had a designated assignment with an approximate time allocated to that session. Each school had the discretion to choose one of two ways in which students, if they were working productively and would like to continue writing, could work past the approximate time allocated for that session. Students either finished the assignment in a quiet setting following the time allocated for Sessions I and II or continued working past the allocated time in the final session until the essay was complete. In other words, there was no time limit for writing. The following were the prescribed assignments and approximate times for each session: Session I: prewriting, first draft, revision – approximately 65 minutes; Session II: drafting, revision, editing – approximately 50 minutes; Session III: revision, editing, final draft, proofreading – approximately 50 minutes.

After all writing assessments were completed at each school, the tests were sent to the district test director, who in turn sent the assessments to the State Department of Education for scoring. The state writing assessment program requires that each student’s writing is read by two trained reviewers and scored on each of the following four traits: (a) ideas and content (development), (b) organization, (c) voice, and (d) conventions. For each trait, each student received one of the following scores: 1 (Beginning), 2 (Emerging), 3 (Developing), 4 (Maturing), 5 (Strong). The summation of the trait scores determined the composite score. The composite score categorized the writing as ED (Emergent/Developing), AS (Approaches Standard), MS (Meets Standard), ES (Exceeds Standard). In the event that the independent reviewers did not agree on the scores, a third reviewer scored the sample. The scores from the two agreeing reviewers were the final measure. This procedure is outlined by the State Department of Education (2008b).

DKFS TEST ADMINISTRATION

Each student was administered the letter fluency, category fluency, and category switching conditions from the D-KEFS (Delis et al., 2001). For the letter fluency condition, the student was given 60 seconds to say as many words as he/she could that began with the letter F. The student then had 60 seconds to say words that began with the letter A and 60 seconds to say words that began with the letter S. None of the words could be names of people, places, or numbers. For the category fluency condition, the student had 60 seconds to name animals and another 60 seconds to say boys’ names. In

the category switching condition, the student had 60 seconds to switch back and forth and say the names of as many fruits then pieces of furniture as possible. The total time for the tests was no more than 6 minutes. For each correct answer, the student was given a score of one. For each incorrect answer, the student was given a score of zero. Raw scores were tallied for each condition: letter fluency, category fluency, and category switching. The total raw scores for each condition were converted to a scaled score. The scaled scores for each student were summarized on a Data Summary Sheet. The information on the Data Summary Sheet was coded in such a way as to conceal the identity of the student participating in the study.

DATA ANALYSIS

To analyze the data, Pearson Product-Moment Coefficients (PPMC) were used to determine correlations between the D-KEFS (Delis et al., 2001) Verbal Fluency Test scores (letter fluency, category fluency, category switching number correct, and category switching accuracy) and the scores on the SPEP Fifth-Grade Writing Assessment. For the data analysis, Statistical Package for the Social Sciences (SPSS) was used.

DESCRIPTIVE DATA

Table 4 shows the means and standard deviations for the D-KEFS verbal fluency tests for all subjects in the study. For the D-KEFS verbal fluency tests, the scaled scores ranged from 1 (lowest) to 19 (highest) with a mean score of 10 and a standard deviation of 3 (Delis et al., 2001). As shown in Table 5, the overall sample mean scores were in the midrange.

Table 4. Means (M) and Standard Deviations (SD) for the D-KEFS Test Scores for Fifth-Grade Students with a LD and for Fifth-Grade Students with TD

Tests ^a	Overall	LD	TD
	M(SD) (n=30)	M(SD) (n=30)	M(SD) (n=30)
Letter Fluency	9.25 (3.13)	7.93 (2.82)	10.57 (2.91)
Category Fluency	10.00 (3.11)	8.87 (2.46)	11.13 (3.33)
Category Switching Number Correct	9.10 (2.69)	7.87 (2.34)	10.33 (2.47)
Category Switching Accuracy	9.48 (2.80)	7.97 (2.59)	11.00 (2.11)

Note. LD = learning disabilities, TD = typical development; D-KEFS = Delis-Kaplan Executive Function System (Delis et al., 2001). ^aAverage fluency ranges between 8.0 and 12.0 for each test.

Means and standard deviations for the trait and composite writing scores on the SPEP Fifth-Grade Writing Assessment for all subjects in the study are shown in Table 5. The SPEP Fifth-Grade Writing Assessment trait scores ranged from 1 (lowest) to 5 (highest) and the composite writing scores range from 0 (lowest) to 20 (highest). The results for the overall sample were slightly above the midpoint. In contrast, the scores for students with a LD were below the midpoint. The scores for students with TD were above the midpoint. The following are the descriptions of the level of development corresponding to the trait score: Beginning: 1; Emerging: 2; Developing: 3; Maturing: 4; Strong: 5. The composite writing score indicates a child's writing performance relative to the state's writing achievement standards. The composite writing scores are labeled according to

the following categories: (Non-proficient) Emergent/Developing: 0 to 7.5; Approaches Standard: 8 to 11.5; (Proficient) Meets Standard: 12-15.5; Exceeds Standard: 16-20 (State Department of Education, 2008c).

Table 5. Means (M) and Standard Deviations (SD) for the Trait and Composite Writing Scores on the SPEP Fifth-Grade Writing Assessment for Students with a LD and Students with TD

Traits ^a	Overall	LD	TD
	M(SD)	M(SD)	M(SD)
Ideas	2.68 (.87)	2.03 (.66)	3.32 (.52)
Organization	2.71 (.85)	2.12 (.72)	3.30 (.47)
Voice	2.71 (.96)	1.95 (.61)	3.47 (.56)
Conventions	2.69 (.98)	1.95 (.72)	3.43 (.55)
Composite Writing Score ^b	10.78 (3.49)	8.05 (2.44)	13.52 (1.82)

Note: LD = learning disabilities; TD = typical development; SPEP = State Proficiency Examination Program ^aTrait scores range from 1-5. ^bRange for Composite Writing Score: Approaches the standard, 8.0-11.5; Meets the standard, 12.0-15.5

The PPMCs coefficients were computed between the D-KEFS verbal fluency test scores and the composite writing score on the SPEP Fifth-Grade Writing assessment for fifth-grade students with a LD in written language and for students with TD. The results of the analyses are presented in Table 6.

The results showed that for students with a LD, the correlations between the two D-KEFS tests of letter fluency and category switching accuracy and the SPEP Fifth-Grade Writing Assessment composite writing score were statistically significant and were greater than or equal to .40. For students with TD, no correlations between the D-KEFS tests of verbal fluency and the SPEP composite writing score were statistically significant.

Table 6. Correlations Between the D-KEFS Verbal Fluency Test Scores and the SPEP Fifth-Grade Writing Assessment Composite Writing Score (CWS) for Students with Learning Disabilities (LD) in Written Language and for Students with Typical Development (TD)

	LF	CF	CS# Corr	CS Acc
CWS: LD	.41*	.30	.18	.40*
CWS: TD	.16	-.05	-.06	-.14

Note: LF = letter fluency; CF = category fluency; CS# Corr = category switching number correct; CS Acc = category switching accuracy; D-KEFS = Delis-Kaplan Executive Function System (Delis et al., 2001); SPEP = State Proficiency Examination Program. *p < .05

DISCUSSION

The PPMCs coefficients were computed between the D-KEFS verbal fluency test scores and the composite writing score on the SPEP Fifth-Grade Writing assessment for fifth-grade students with a LD in written language and for fifth-grade students with TD. The results for the students with a LD in written language indicated that letter fluency (LF) and category switching accuracy (CS Acc) tests were significantly correlated with the composite writing score (CWS) on the SPEP Fifth-Grade Writing assessment.

Consequently, the results indicated that students with a LD in written language, who score low on the category switching accuracy and letter fluency tests, may also score low on the composite writing score of the SPEP test. In the category switching accuracy test, the student is asked to alternately name a fruit and then a piece of furniture. The score is the number of accurate switches made. The category switching accuracy may be correlated with the composite writing score because the category switching accuracy test requires two tasks to occur simultaneously: (a) holding an idea in one's head and (b) planning for another idea. These two tasks are also necessary components for good writing skills. For example, when writing an essay a student must write a topic sentence and supporting details while at the same time evaluate the writing to ensure cohesiveness and to plan for future paragraphs.

The relationship between the letter fluency test and the composite writing score may be a function of the linguistic demands that are necessary for success on the letter fluency test. In the letter fluency test the student is asked to name, one at a time, all the words he/she can recall that begin with the letters "F," "A," and "S." Thus, with minimal structure and no context to visualize, the student must quickly choose vocabulary words from a wide, open-ended prompt. This makes it difficult for the student to find specific words to use that are appropriate for the prompt. Similarly, in the classroom, when writing from a prompt that has minimal structure (e.g., write about your summer vacation), the student must search a large data base (all experiences during a 3-month period) to choose the appropriate words for the discourse. A student with inefficient planning and memory strategies may write a few words, such as play or swim, but not be able to organize the text in a way that makes sense or be able to recall other words that would be appropriate for the essay. In contrast, a student with efficient planning strategies may write, "In the beginning of the summer I... In the middle of my summer... I ended my summer by..." Furthermore, the mature writer would be able to recall words that would be appropriate for each section, such as writing about his/her camp experiences at the beginning of summer.

In contrast, category fluency and category switching number correct tests were not correlated with the composite writing score for students with LD in written language. These two tests, as previously described, provide a structure from which to recall words. That these tests did not correlate with scores on the writing test is not surprising, given that students with writing difficulties demonstrate more mature writing skills when provided with structure (De La Paz & Graham, 1997; Swanson, 1994).

For the students with TD, there were no statistically significant correlations between the D-KEFS tests and the composite writing score on the SPEP test. This indicated that improved verbal fluency skills did not correlate with writing skills. In addition, even though 93% of students with TD met the standard for the SPEP Fifth-Grade Writing Assessment, only 20% of the students with TD exceeded the standard. This indicated that the writing scores for the TD student population were not as high as one would expect from the TD population. An explanation for the lack of correlation between the D-KEFS tests and composite writing score and the absence of a significant number of high scores on the composite writing score for the TD population may be that once verbal fluency skills are intact, there may be other executive functioning skills, such as attention and self-monitoring, that significantly affect writing skills. Research has shown that the development of written language skills depend on high levels of executive functioning skills (Feifer & De Fina, 2002; Hale & Fiorello, 2004). Moreover, the major cognitive/neuropsychological models of writing indicate that characteristics of

proficient writers include well-developed executive functioning skills, such as initiating, sustaining, inhibiting, shifting, organizing, planning and self-monitoring (Abbott & Berninger, 1993; Hayes & Flower, 1980; Juel, 1988). Studies investigating the effects of a number of executive functions on the writing skills of elementary school children found that the executive functioning skills of inhibition, verbal fluency, planning, and switching attention (Altemeier, Jones, Abbott, & Berninger, 2006) as well as initiating and sustaining (Hooper, Swartz, Wakely, de Druif, & Montgomery, 2002) made significant contributions to the development of writing skills.

Since the results of this study indicated that for the LD population there was a correlation between two D-KEFS tests and the SPEP Fifth-Grade Writing Assessment composite writing score, and for the TD population there were no correlations between the D-KEFS tests and the SPEP Fifth-Grade Writing Assessment composite writing score, overall, it appears that verbal fluency executive functioning skills have more of a relation to writing skills for students with a LD in written language than they do for students with TD. At least average verbal fluency executive functioning skills are necessary for a student to be a good writer; however, once a student is a good writer there may be executive functioning skills, other than verbal fluency, (e.g., planning and organizing), that affect the student's writing skills.

The present findings indicate that verbal fluency and executive functioning skills play an important role in writing for students identified with a LD. For example, in the letter fluency test, the student must find words to use from a minimal prompt and in the category switching accuracy test, the student must not only think of words from a designated category but must also hold in his/her mind the last word said and decide what category the next word should come from before choosing a word. Thus, these findings support the theory that verbal fluency and executive functioning skills are an integral part of the writing process for students with a LD, and that one must ultimately multitask in order to be a competent writer.

RESEARCH SIGNIFICANCE OF CURRENT RESULTS

The results of the current research study correspond to previous research on writing. Research has shown that students with a LD have difficulty formulating ideas and writing down appropriate words for the topic or audience (verbal fluency skills; Berninger et al., 1992; Graham & Harris, 2003). However, with delineated guidelines and structure, such as with the Self-Regulated Strategy Development (SRSD) strategies, studies have shown that students with a LD significantly improve their writing skills (Graham, MacArthur, Schwartz, & Page-Voth, 1992; Harris et al., 2003). In the current research study, the letter fluency test, which had minimal structure (e.g., name words that begin with "F"), significantly correlated with the composite writing score for students with a LD. For the population of students with a LD, most had low composite writing scores and did not meet the writing standard. Based on the correlation of the two tests, this research has shown that on the letter fluency test, students with a LD have the most difficulty generating words from an open-ended, nonstructured prompt. In contrast, when given a specific category, such as on the category fluency test (e.g., name animals), students with a LD were able to generate an appropriate list of words as demonstrated by the higher scale scores and mean for the category fluency test and the absence of a significant correlation with the composite writing score. This study extended previous research by demonstrating that with structure and parameters, verbal fluency skills improve for students with a LD.

Moreover, research has shown that students with a LD have difficulty with the executive functioning skill of shifting back and forth among the tasks involved in writing (Bain, Bailet, & Moats, 2001; Hayes & Flower, 1980). This research has shown that in the category switching accuracy test, students with a LD had difficulty shifting back and forth between categories (fruit and furniture), as evidenced by the significant correlation between the category switching accuracy test and the composite writing score. This further confirms the research that students with a LD have difficulty with the executive functioning skill of shifting.

The current research results have implications for educational instruction. Students with a LD in written language did better on verbal fluency tests with structure and the ability to visualize than on verbal fluency tests that lacked parameters. Consequently, students with a LD in written language may improve writing skills with instruction strategies that involve structured tasks that allow students to visualize the writing topic. For example, in the classroom a typical writing prompt that is not structured, lacks parameters, and is difficult to visualize may be, "Write about why you think the school day should be shorter." In this example, the prompt is not structured because it is open-ended and there are countless ways to approach the topic. Students may be overwhelmed by the "bigness" of the question and not know where or how to begin to think of ideas. The prompt is also difficult to visualize because it is abstract and not concrete. A prompt that is considered structured, concrete, and easy to visualize would be, "During the first month of school we did many morning activities with the other fifth-grade class. Describe your three favorite activities and tell why you liked them." In the second prompt, the student is given a writing task with a clearly delineated structure (describe your three favorite morning activities and tell why you liked them). In addition, the student can easily visualize the second prompt by recalling and picturing him/herself participating in the morning activities. Consequently, the second prompt, with clearly defined guidelines, is an easier prompt to write about.

Furthermore, in the content standards for the school district's writing achievement indicators (State Department of Education, 2008a), students need to generate ideas for a specific topic. There are a number of instructional strategies that teachers can use to help students achieve the writing standard goal. For example, with regard to structure, teachers may provide students with descriptive prompts, stories with fill-in-the-blanks, and lists of words to use in a writing task. Additional structure includes story/essay outlines in flow chart-like structure, story maps, and web designs (Bain et al., 2001). Moreover, developing a word list based upon a student's personal experiences enhances the learning process (May, 1986). In this way, a teacher can assist a student with visualization techniques by having the student write about concrete, visual items known to the student such as a student's house or pet animal.

In the current study, given that executive functioning and verbal fluency skills had a relation to writing skills for children with a LD in written language, teachers can use instruction strategies utilizing both skills. For instance, using executive functioning skills such as the SRSD (Self-Regulated Strategy Development) strategies that have been researched by Graham and Harris (2005) together with specific verbal fluency skill building strategies (discussed below) may substantially increase the writing skills of students with a LD in written language. The SRSD strategies help students use their executive functioning skills when writing, such as the instruction strategy of SPACE (Setting, Problem, Actions, Consequence, Emotions) for narratives and DARE (Develop

a topic sentence, Add supporting details, Reject arguments, End with a conclusion) for persuasive essays (Troia, Graham, & Harris, 1999).

Another writing content standard for the school district includes using transitions that add to the organization of the paper (State Department of Education, 2008a). Teachers can provide verbal fluency skill-building strategies to assist with this writing skill. Emig (1971) noted that free writing increases verbal fluency skills. Hillocks (1986) recommended that free writing take the form of daily journal writing or free and spontaneous writing prompted by music or other particular stimuli. Additional verbal fluency skill building activities include strategies to increase brainstorming ideas prior to writing (Hale & Fiorello, 2004), supplying word lists around a theme, and helping students brainstorm on words to use to convey similar meanings in a sentence (Bain et al., 2001).

To conclude, to help improve the writing skills of students with a LD in written language, teachers can provide structured, concrete writing assignments (e.g., Describe your three favorite play activities and why you like them) using instructional strategies that include cueing (e.g., provide a list of words to use in the text), visual outlining (e.g., web outline), executive functioning skills (e.g., SRSD strategies), and personal experiences.

LIMITATIONS OF THE STUDY

The study was limited in that all participants were enrolled in schools with a large percentage of students who were White. Moreover, nearly 50% of the students in the study were from schools with the lowest percentage of free and reduced lunch. Future research should include participants from diverse ethnic and socio economic backgrounds that more accurately reflect the demographic population of the United States. That said, IRB restrictions at the university and school district level limited the demographic data available to researchers. The study was also limited by the inclusion criteria for participating in the study for students with a LD and for students with TD. For the former category, LD, students had to have at least one reading/and or writing goal in their IEP. Students may have had other disabilities, such as bipolar disorder and Attention Deficit Disorder, which could also impact written language skills. For the latter category, TD, students had to be enrolled full-time in the general education classroom in addition to not receiving Section 504 services. However, students with TD may have had low academic performance test scores and possibly in the future would receive special education services. If this was the case, the two groups may have been somewhat similar and the difference in the performance of the two groups may actually be more pronounced. Future research should narrow the criteria required to be a participant in the LD or TD categories. Finally only one executive functioning skill (verbal fluency) was addressed in this study. Future research should address the contribution of multiple executive functioning skills (e.g., initiating, sustaining, inhibiting, shifting, organizing, planning and self-monitoring) to the writing process. Additionally, future studies should focus on the importance of executive functioning skills to the writing process at different chronological and/or developmental ages.

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