GENDER DIFFERENCES IN WRITTEN EXPRESSION CURRICULUM-BASED MEASUREMENT IN THIRD THROUGH EIGHTH GRADE STUDENTS

A Thesis

By

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FOREWORD

This thesis is written in accordance with the style of the *Publication Manual of the American Psychological Association (5th Edition)* as required by the Department of Psychology at Appalachian State University

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Abstract

Many studies have found gender differences in certain areas of academic achievement, such as reading and math (Davenport et al., 2002; Gibb, Fergusson, & Horwood, 2008; Klecker, 2005; Marks, 2008). Fewer studies have focused on gender differences in writing skills. The current study examined gender differences in written expression performance. Participants were 1,240 (600 males and 640 females) students in third through eighth grade representing five schools in a rural southeastern school district. Each student was administered an AIMSweb curriculum-based measurement writing probe. All measures were scored for total words written (TWW) and correct writing sequences (CWS). Both measures take into account how much the student has written within the time limit. Students completed these probes during the district's regularly scheduled fall, winter, and spring benchmarks. Each student wrote a story for three minutes based on an age-appropriate story starter. Two-way repeated measures analyses of variance were used to determine if differences existed in the sample. A significant female advantage was found on both scoring indices at each grade level. Findings indicate that females not only wrote more words than males, but they also tended to be more correct in the use of these words. These findings have strong instructional and theoretical implications for practicing school psychologists and other educators.

Gender Differences in Written Expression Curriculum-Based Measurement in Third through Eighth Grade Students

Gender differences in academics have been researched throughout the world in many different subjects. As more schools are shifting to a problem-solving framework that emphasizes early identification and prevention of academic failure, curriculum-based measurement (CBM) is becoming increasingly popular with educators to use for screening, progress monitoring, and eligibility decisions. Previous researchers have established the reliability and validity of CBM measures in early literacy, reading, math, and written language (Christ, Scullin, Tolbize, & Jiban, 2008; Fewster & MacMillan, 2002; Gansle, Noell, VanDerHeyden, Naquin, & Slider, 2002). Unlike most standardized measures, CBM assessments are sensitive to small changes in a student's performance. Previous researchers have found gender differences in CBM of written expression in favor of females (Jewell & Malecki, 2003). It is important for educators to be aware of these differences, since these measures are often used for decision making.

Gender Differences in Intellectual Abilities

Many researchers have established gender differences between male and female scores in academic achievement, with females having the general advantage (Camarata & Woodcock, 2005; Gibb, Fergusson, & Horwood, 2008; Marks, 2008). However, when intellectual abilities are compared, the disparity between genders is not as apparent. Ackerman (2006) researched the differences and similarities across genders that have been found on different measures of cognitive abilities. He suggests that gender differences in cognitive abilities lie in the construction of the particular cognitive assessment. In the past, test creators have ensured equal mean IQ scores for boys and girls. Terman and Merrill

(1937) actually eliminated the subtests from the Stanford-Binet Intelligence Scale for which there were large gender differences. Terman and Merrill described this method as taking out certain subtests that were deemed “less fair” for one gender than the other. On this measure of intelligence, Terman and Merrill found that “the means below 6 years tend to run about 2 points higher for girls, from 6 to 13 years about 2 points higher for boys, and above 13 years about 4 points higher for boys” (p. 34). They suggested that some of these differences could be due to biased sampling.

More recent research on intelligence has produced mixed evidence for differences in measured cognitive abilities across gender. For example, Gibb et al. (2008) conducted a longitudinal study with 1,265 people from birth to age 25. Using the Wechsler Intelligence Scale for Children, Revised (WISC-R; Wechsler, 1974), they did not find significant differences between genders on any of the cognitive abilities measured. Verbal IQ, Performance IQ, and Full Scale IQ scores were compared. Another study by Naglieri and Rojahn (2001) examined gender differences in planning, attention, simultaneous, and successive (PASS) cognitive processes on the Cognitive Assessment System (Naglieri & Das, 1997). They found that boys and girls performed equally on tasks involving simultaneous and successive processing, but girls outperformed boys on tasks using planning and attention.

Duckworth, Seligman, and Martin (2006) administered the Otis-Lennon School Ability Test—Seventh Edition (Harcourt Brace Educational Measurement, 1997) to determine if gender differences existed in their sample. They also collected achievement data from standardized tests and teacher grades. They found that although girls obtained higher grades than boys in most subjects, they did not outperform boys on standardized achievement measures or on ability scores from the Otis-Lennon School Ability Test. In fact, boys' IQ scores were significantly better than the girls' scores.

Although most researchers have concluded that overall ability scores do not differ significantly between boys and girls, differences do exist when more specific skills are examined. Some researchers have shown gender differences in visual-spatial abilities, mathematical reasoning, and verbal abilities. Halpern (1997) found that gender differences are observed in visual-spatial ability, in which tasks require the student to imagine and mentally manipulate two- and three-dimensional figures. These data indicate males perform significantly better than females on this type of task. Halpern also showed that girls may have an advantage over boys in some verbal abilities.

As part of a study by Camarata and Woodcock (2005), 1,987 students completed the Woodcock-Johnson 3: Tests of Achievement (Woodcock, McGrew, & Mather, 2000a) and the Woodcock-Johnson 3: Tests of Cognitive Abilities (Woodcock, McGrew, & Mather, 2000b). Their findings indicate that males had significantly lower processing speed (Gs), or the ability to quickly take in and process information, than females. On the other hand, males scored significantly higher than females on estimates of comprehension knowledge (Gc), or one's ability to verbally express one's knowledge of factual and procedural information. Although they did find discrepancies in specific abilities, Camarata and Woodcock did not establish overall differences between General Intellectual Ability (GIA) scores. The results from both of these studies are consistent with previous research findings indicating there are gender differences in specific abilities, but not in overall intelligence (Halpern, 1997; Naglieri & Rojahn, 2001).

To summarize, most researchers have concluded that overall scores on measures of intellectual ability (e.g., GIA, FSIQ) do not differ significantly across genders. Although some studies have found differences in more specific, narrow intellectual abilities (Halpern, 1997; Naglieri & Rojahn, 2001), the support for these differences is limited. Any differences in specific abilities could offer explanations for the widely accepted achievement gap between genders (Camarata & Woodcock, 2005; Gibb et al., 2008; Marks, 2008).

Gender Differences in Academic Achievement

Many studies demonstrate gender differences among students in different areas of academic achievement, such as reading, writing, and math. Gibb et al. (2008) assessed word recognition in children ages 8-18 using the Burt Word Reading Test (Gilmore, Croft, & Reid, 1981) and reading comprehension in children ages 10-12 using the Progressive Achievement Test of Reading Comprehension (Elley & Reid, 1969). Mathematical reasoning was assessed in children ages 8-13 using the Progressive Achievement Test of Mathematical Reasoning (Elley & Reid). These researchers measured overall academic achievement with the above standardized tests, as well as attainment of high school graduation requirements, university attendance, and university degree attainment. They found that females scored significantly higher than boys on all measures. This difference was apparent at age 8 and continued through age 25 (they did not collect data after age 25). Data from the Camarata and Woodcock (2005) study described previously also found that males displayed significantly slower performance than females on timed achievement measures, such as reading and writing fluency. Marks (2008) also identified a gender gap in math in favor of males and in reading in favor of females after analyzing data from the Organization for Economic

Cooperation and Development's 2000 Programme for International Student Assessment project.

Other researchers also have evaluated gender differences in more specific academic areas. The National Assessment of Educational Progress (NAEP) database indicates that girls in the fourth-, eighth-, and twelfth-grades scored significantly higher on the NAEP reading assessment than boys of the same age (Klecker, 2005). Effect sizes increased from 4^{th} to 8^{th} to 12^{th} grade as the difference between genders increased.

The Office of Educational Accountability of the University of Minnesota administered the Minnesota *Basic Skills Test* (BST; *Procedures Manual*, 2008) to eighth-grade students from 1996 to 2001. The BST measures math, reading, and writing skills of eighth-grade students. In Minnesota, students are required to pass the BST in reading and math in order to receive a high school diploma. In this particular study, over 50,000 students were administered the reading and math sections of the BST each year of data collection. Researchers found that eighth-grade females outperformed boys on the BST in reading. Furthermore, these data revealed that the gap was not decreasing (Davenport et al., 2002). The difference in reading was large and was consistent through the six years of testing, at .17 standard deviation units in favor of girls.

Lehto and Anttila (2003) found specific differences in listening comprehension, which, according to these researchers, can be a good predictor of an individual's skills in reading comprehension. Second-, fourth-, and sixth-graders listened to six passages read on a compact disk. Then, participants listened to 12 sentences related to the passages and were told to mark on their answer sheets whether each sentence was correct or incorrect. Girls' listening comprehension scores were significantly higher than boys' scores, and the difference was comparable to those typically found for females in reading comprehension.

Many researchers have found the opposite pattern when it comes to mathematical skills. As mentioned above, Davenport et al. (2002) administered the reading and math sections on the BST. They found that boys typically had higher scores in mathematics, but in contrast to the pattern of gender differences in reading, the differences in math performance scores decreased over time. For example, the difference in math scores in 1996 was .07 standard deviation units in favor of males and, in 2001, the difference dropped to .01. Preckel, Goetz, Pekrun, and Kleine (2008) researched gender differences in gifted students and students of average ability. They found that boys typically scored higher than girls in mathematical reasoning. They also created and administered a math literacy test. When performance on this test was compared with classroom grades, the researchers found that gifted males outperformed gifted females on mathematical literacy, but gifted males and females had equally good grades in math.

Although significantly lower scores on reading achievement measures for males compared to females have been well documented, there is less agreement among researchers on the differences in mathematics. Though Davenport's (2002) results indicated that males scored higher than females on measures of mathematical skills, results from a study by Narahara (1998) are contradictory. Narahara administered the TerraNova Second Edition California Achievement Test (CTB/McGraw-Hill, 2001) to second graders and found females surpassed males in both reading and math. Clearly, equivocality still exists when mathematical abilities are compared. It is important that researchers continue to investigate these academic differences.

Gender Differences in Written Expression

A smaller body of research has focused on gender differences in the area of written expression, although several studies have been conducted. Berninger, Nielson, Abbott, Wijsman, and Radskind (2008) recruited adults and children with dyslexia for a comprehensive study of written expression. The following instruments were used to assess various areas of written expression: the Written Expression subtest of the Wechsler Individual Achievement Test—Second Edition (The Psychological Corporation, 2002) was used as a general measure of written expression skills; the Wide Range Achievement Test—Third Edition (Wilkinson, 1993) was used to measure participants' spelling accuracy; the Process Assessment of the Learner (Berninger, 2001) was used to measure participant's orthographic skills; the tasks of Rapid Automatic Naming and Switching also were administered to assess automaticity. For both children and adults with dyslexia, gender differences in measures of automatic letter naming, orthographic skills, and written expression were apparent. Adults also exhibited gender differences in spelling scores. Orthographic skills were measured by assessing participants' abilities to quickly encode words into short term memory, to quickly write these encoded words, and to choose the correctly spelled word among a group of words that are pronounced the same. Significant gender discrepancies in orthographic skills were found for both children and adults. Girls surpassed boys on all orthographic measures. Orthographic skills are helpful in breaking down written words to verbalize them and in taking verbalized words and spelling them while writing. These researchers suggest that, although writing disabilities occur across genders, males tend to have more severe problems in the area.

Fewer studies have found specific gender differences when comparing scores from informal measures of writing, such as written expression curriculum-based measurement (WE-CBM). Jewell and Malecki (2003) administered 3-minute writing probes to first through eighth grade students in three different school districts in Illinois. The students were presented a simple story starter and were given 1 minute to think about what they were going to write and 3 minutes to write their stories. Six different scores were provided for the writing probes that represented production-dependent, or fluency, and production-independent, or accuracy, aspects of the writing process. Jewell and Malecki found that girls outperformed boys on all six writing indices. Many individual schools collect CBM data to create local norms. Jewell and Malecki cautioned that unless school professionals take gender into account when they establish the norming data, boys could be over-identified for problems in writing.

In a follow-up study, Jewell and Malecki (2005) collected WE-CBM scores, Stanford Achievement Test (Madden, Gardner, Rudman, Karlsen, & Merwin, 1978) scores, and students' Language Arts grades in second, fourth, and sixth grades. Girls significantly outperformed boys on all WE-CBM fluency measures. Their results indicated that girls in the sample produced more written material, more correctly spelled words, and more correct writing sequences than boys. However, they did not find gender differences in the production-independent or accurate production indices. In other words, the researchers concluded that males and females were equally accurate in their writing, though girls produced more writing than boys.

Effects of Gender Differences

Gender differences influence a number of school-related variables. It is important that research continue to focus on gender differences in academic achievement. Knowledge about male and female differences may influence educational decisions of teachers and parents. Some researchers postulate that age of entrance significantly impacts student achievement, regardless of gender. However, a study by Narahara (1998) actually compared the effects of age of entrance and gender differences on reading and math achievement. They found a greater difference between genders in reading and math when compared to age of entrance differences. In other words, the fact that a student is a boy may have bigger implications for his future academic achievement in reading and math than the age that he entered school. These results are important for parents to be aware of when they make educational decisions for their children. For example, O'Donnell and Mulligan (2008) found that a higher percentage of parents of boys planned to delay their children's entry into kindergarten than parents of girls. Furthermore, Graue and DiPerna (2000) found that kindergarten screening tests tend to identify girls as cognitively and socially more mature than boys.

DeMeis and Stearns (1992) found that more boys than girls were referred for psycho-educational evaluations in their kindergarten year and were placed in a school district's mental health care program for students at risk. These researchers also stated that, for those concerned with the age-of-entrance issue in schools, gender should receive more attention than age. This conclusion was based on the fact that gender was a more significant variable in determining if kindergarteners were placed in an intensive mental health program. In other words, being a boy was a stronger predictor of being recommended for or placed in the mental health program than being young.

Often, there is a correlation found between academic achievement and behaviors in the classroom. Researchers also have established that there are gender disparities in children's behavior. Gibb et al. (2008) found that teacher reports indicated that boys displayed "significantly higher levels than females of distractable, restless, inattentive behaviour and aggressive, antisocial, oppositional behaviour" (p. 72) in the classroom. Eaton and Enns (1986) also suggested that boys are predisposed to be more active than girls, indicating that boys may be more likely to have classroom discipline problems. Because boys are more likely to exhibit behavioral problems, they are more likely to be referred to special education and diagnosed with disabilities than girls (Aylward, 2002).

Gender differences also have been found to persist as children age and to influence the educational decisions they make. In most school systems, high school students can take Advanced Placement (AP) tests in various content areas in order to earn credit for college courses. Ackerman (2006) noted that females took more AP tests across all areas. However, more males completed the Calculus, Chemistry, and Physics AP tests and, compared to females, a higher percentage of males had passing scores on tests in those areas. These findings are consistent with earlier findings of males outperforming females in math and science literacy.

Just as children choose whether or not to take AP courses, they choose to drop out of school. Dropout rates have been found to be higher for males than females (Freeman, 2004). Data from Freeman showed that in 2001, the percentage of males who dropped out was 12 percent, whereas for girls it was only 9 percent. This same study indicated boys were also more likely to be retained than girls. For example, in 5- to 12-year-old students, approximately 8 percent of boys had repeated a grade since they started school as compared to 5 percent of girls. It is important for researchers to know more about gender differences in academics because of the various outcomes they predict. A central part of this research also should focus on why gender differences exist in certain academic areas and not in others.

Theories of Gender Differences

Over the past few decades there has been an ongoing debate over the reasons behind gender disparities in academic achievement. Researchers have speculated that these differences may be due to a number of factors. Biological differences between males and females have been purported as one possible cause of gender differences (Geschwind & Galaburda, 1987; Naour, 2001). It also has been cited that boys and girls have different sets of behaviors, attitudes, and values that they bring into academic situations that may impact their performance. Meece, Glienke, and Burg (2006) suggest that motivational qualities may have an effect on gender differences in achievement. According to Meece et al., motivational beliefs include competency, value, and self-efficacy. Competency beliefs are an individual's assumption of the level of success or failure he or she will achieve at a particular activity. Value beliefs represent the value an individual places on that particular activity. Self-efficacy encompasses the previous two beliefs and is the overall confidence an individual has in learning and performing a specific task. The motivational beliefs of girls and boys typically follow gender-role stereotypes. For example, boys showed more motivational beliefs in math and science, and girls had more self-efficacy in language and writing (Meece et al.). Ready, LoGerfo, Burkam, and Lee (2005) obtained teacher reports that indicated that girls used more positive learning approaches, which might explain some of the gender differences in literacy development. Controlling for boys' external behavior problems did not seem to decrease the gender differences in language development. Males are more likely to exhibit behavioral characteristics, such as impulsivity and physical aggression, during play and strength in performing visual-spatial tasks, among others. Naour (2001) proposed that these traits are common in children with learning disabilities. Males account for almost 75 percent of the learning disabled population in the US (National Education Association, 2007).

One study found girls scored lower than boys in terms of academic self-concept, interest, and motivation in math (Preckle et al., 2008). Another study demonstrated that adult "males rated their overall IQ as well as their cognitive, creative and political intelligence as significantly higher than females" (Furnham, 2005, p. 91). Inferring from the data above, it is obvious that self-concept differences do not reflect actual scores and gaps in academics or intelligence.

In contrast, Meece et al. (2006) found that rates of motivation are similar to the actual trend in academic scores. For example, boys tended to believe they had better skills and were more interested in math and science, whereas girls had more assurance and interest in language arts and writing abilities. There was a motivation gap in favor of males in math and science that tended to close as children aged, but the gap in language arts and writing (in favor of females) remained the same throughout school. These findings could indicate that motivation, interest, and self-concept may affect performance in specific areas of academics. These differences support the idea that, overall, girls and boys differ in their beliefs about different skill sets. These belief discrepancies may affect how children and adults perform on measurements of these skills.

Most findings on gender differences in motivation support the idea that environmental factors affect motivation beliefs more than actual successes and/or failures. For example, male students may have higher self-concept, interest, and motivation in math due to schooling or parenting influences. Parents and teachers may instill these beliefs, deliberately or not, in children starting at a very young age. Educators and parents should be aware of these differences and should be cautious in making assumptions about a student based on his gender.

Many other researchers have theorized the causes or factors affecting these differences. For example, Gibb et al. (2008) suggested that school factors, such as learning and assessment procedures set by schools, can impact girls and boys differently. Researchers have also suggested that gender differences in school grades are due to self-discipline (Duckworth et al., 2006). As mentioned earlier, higher cognitive processes in planning and attention in females may have an impact on differences in achievement (Naglieri & Rojahn, 2001).

Researchers have suggested that gender differences stem more from biological distinctions. In 1987, Geschwind and Galaburda proposed "that fetal testosterone levels slowed normal development in the left hemisphere… [and] disrupted early language development" (McManus & Bryden, 1991, p. 237). This theory suggested that, during fetal development, the left side of the brain is somewhat impaired by testosterone in boys, which in turn could account for the deficiencies in boys' language and, more specifically, in writing development. There have been very few subsequent research findings that provide evidence relative to this theory; however, researchers recently found "a significant relationship between fetal testosterone and sexually differentiated play behavior in both girls and boys" (Auyeung et al., 2009, p. 147). Naour (2001) added to this idea that male fetal testosterone levels could cause differences in male brains. He noted that the sex differences caused by fetal testosterone levels are very similar to the differences between the brains of the children with learning disabilities and those of the general population. Naour’s research could provide more evidence for why there are more males with learning disabilities than females.

Other researchers propose developmental differences between sexes within the nervous system that change the functional organization of the brain. Such biologically based differences in organization would affect the development of differential processing abilities related to learning, which could account for gender differences in academics. Naour (2001) suggests that the typical male newborn population is more likely to respond to visual stimuli, whereas females are more likely to respond to auditory stimuli. This hypothesis is similar to one offered to account for some learning disabilities, suggesting that there is a weakness in receiving auditory information, but there is a strength in visual reception. Obviously, there is a difference in learning and thinking processes between children diagnosed with learning disabilities and children without the diagnosis. Naour hypothesized that people diagnosed with learning disabilities have much more severe deficits in auditory reception than the general male population. Naour also advocates that teaching in the schools is primarily delivered verbally (requiring verbal processing); therefore, females are at an advantage in the classroom, whereas males tend to struggle because of their auditory processing differences.

Other researchers suggest that gender differences are rooted in cultural or societal beliefs and values. Preckle et al. (2008) investigated the role that gender plays in teachers’ behavior and reactions to students. They found that teachers generally awarded girls the same overall grades as boys, even though the girls’ performance scores were much lower in mathematics. Preckle et al. suggested that teacher and parent expectations and gender-role socialization practices are primarily to blame for achievement differences in math literacy.

These findings could explain that, as males develop, they become more motivated in mathematics than do girls.

Van Langen, Bosker, and Dekkers (2006) investigated gender differences across many different countries around the world. They made an interesting discovery that “the gender achievement gap for reading literacy appears to be related to the economic activity of the females in a country: Girls tend to have a greater reading lead on boys in countries with a greater female rate of economic activity” (p. 174). These researchers also found that female participation in science, technology, engineering, and math courses was generally much lower than males within the society that student lived in. These findings suggest gender differences in reading are influenced across all countries, but the math and science gap may not be as culturally influenced.

The Development of Writing

Researchers contend that the skill of writing is acquired in a hierarchical manner and must be developed in this way (Berninger et al., 2006; Duckworth & De Bevoise, 1986). Berninger et al. completed a study on the early development of writing skills. They described the acquisition of handwriting skills during these years as proceeding through the following sequence: as infants, we discover crayons and explore their use by scribbling; as toddlers, we can imitate the production of simple shapes, lines, and circular strokes using crayons; and as first graders, we can automatically and accurately write all of the lower case letters in order.

Various aspects of the writing process can be assessed. Puranik, Lombardino, and Altmann (2008) conducted a study focusing on the development of writing in students in grades three through six. They used a text-retelling format to assess the students’ writing that involved reading a passage to students and then having them retell the story through writing.

The students' writing samples were scored on the following dimensions: productivity, complexity, and accuracy. Students in fifth and sixth grades wrote more words and remembered more content than third and fourth graders. However, Puranik et al. did not find significant differences in the complexity or accuracy of the writing samples across grades. The similarities in the accuracy dimension were most likely due to the older students' attempts to create more difficult sentences and, therefore, make more mistakes in their writing.

Duckworth and De Bevoise (1986) suggested there are two major components involved in the development of writing at the secondary level: subjective engagement and cognitive operations. A student's subjective engagement can be defined as his or her "interests, purposes, ideas, and insights" (p. 4) during the thinking process before and during the actual task of writing. According to Duckworth and De Bevoise, the actual process of writing is carried out through planning, translating, reviewing, and revising. Referring back to the research of Naglieri and Rojahn (2001), girls outperformed boys in both planning and attention in general. If planning is a necessary skill for writing at the secondary level, then gender differences found in planning and attention could have implications for children's development of writing skills.

Berninger et al. (2006) suggested that humans have a number of different "language systems" (p. 66). These systems may include listening comprehension, oral expression, reading comprehension, and written expression. Their data established significant correlations among the development of these language systems, except for listening comprehension, from grades one through five. In other words, oral expression, reading comprehension, and written expression all develop at relatively similar rates throughout the primary grades. These findings indicate that verbal abilities, reading skills, and writing abilities are interconnected and develop at similar paces. Berninger et al. also stated that, in their early elementary years, children begin to see writing as more than a motor activity and transition to “language by hand” (p. 63).

Juel (1988) conducted a longitudinal study involving 54 children from grades one through four who completed various reading and writing measures. Juel found that skills in early writing were predictors of later writing skills, but early reading skills were better predictors of later reading abilities. He also found that poor readers typically became poor writers and that children who were poor readers and writers could not write or tell a good story.

Purpose of the Current Study

The research in the development of writing provides evidence that early writing skills influence the development of more advanced writing skills. Because of the hierarchical nature of writing development (Berninger et al., 2006), identifying both which specific skills are necessary for writing and when gender differences emerge may have meaningful instructional and theoretical implications. CBM assessments offer performance scores that are sensitive to small changes and have many forms, so they may be administered repeatedly. In this study, these repeated, sensitive assessments allowed investigators to identify patterns in performance that could not be detected using standardized assessments, which are more susceptible to practice effects. Three research questions were addressed in this study:

1. Will gender differences be found in CBM assessments of written expression? If so, on which particular indices (Total Words Written and Correct Writing Sequences)?

2. If differences are found, is there a specific age or grade of onset when they begin to

appear?

3. If differences are found, what is the pattern across ages and grades?

Hypotheses

Previous researchers have found gender differences in writing, and we expect to replicate these findings. Following the research trend, we also expect to find a general female advantage in written expression. In the past, researchers have found gender differences in writing as early as first grade. We expect to find these differences in our sample beginning at third grade. Researchers also have found that girls may actually produce more writing than boys (Jewell & Malecki, 2005). We expect to find that female Total Words Written (TWW) scores will be significantly higher than male scores in this area.

Method

Participants

Participants in this study were 1,240 (600 males and 640 females) general and special education students in third through eighth grades. The overall sample population was made up of approximately 48 percent males and 52 percent females. Participants represented five schools in a rural southeastern school district. See Table 1 and Table 2 for additional sample characteristics. The current study gained university IRB approval on September 9, 2008 (see Appendix A for approval) and was conducted in accord with ethical standards. Approval from the public school system was obtained on May 13, 2008 (see Appendix B for approval).

Description of Measure

Each student was administered an AIMSweb CBM in written expression (WE-CBM) benchmark probe. AIMSweb WE-CBM probes are increasing in popularity and are being used for universal screening, progress monitoring in general and special education, and determining Adequate Yearly Progress (AYP) in writing skills. WE-CBM can be scored to yield six different indices, although not all school districts use every score. TWW is scored by counting the number of words the student wrote during the time period, even if they are spelled incorrectly. The Words Spelled Correctly (WSC) score reflects correctly spelled words, even if the words were used incorrectly in context. The Correct Writing Sequences (CWS) score accounts for writing sequences that are correct in context. Each CWS is "two adjacent writing units (words and punctuation) that are correct within the context of what is written" (Powell-Smith & Shinn, 2004, p. 11). For Correct Minus Incorrect Writing Sequences (CMIWS), the number of incorrect writing sequences is subtracted from the CWS score. The Percentage of Words Spelled Correctly (%WSC) is the WSC score divided by the TWW score. Similarly, the Percentage of Correct Writing Sequences (%CWS) is the CWS divided by the total number of writing sequences. TWW, WSC, and CWS are considered production-dependent indices, or fluency measures that rely on length. Indices such as %WSC and %CWS are production-independent, indicating the measure is based on accuracy. Production-independent indices do not correlate strongly with qualitative scores of writing and are therefore, lacking in validity (McMaster & Espin, 2007).

In the current study, writing skills were measured based on production-dependent indices. These indices take into account how much the student writes within the time limit. Overall reliability for this measure has been established through past research, indicating these scoring methods are both accurate and stable (Marston & Deno, 1981). Fewster and MacMillan (2002) administered WE-CBMs to fifth- and sixth-grade students and established a significant positive correlation between these scores and the students' end of the year grades in English. They suggested that this finding provides evidence for the predictive validity of WE-CBM scores as indicators of academic performance in writing.

Procedures

Students completed WE-CBM probes from AIMSweb during the district's regularly scheduled fall, winter, and spring benchmarks. Each student wrote a story for three minutes based on an age-appropriate story starter. See Appendix C for a sample writing probe. All writing probes were administered and scored by a trained assessment team that included the district's school psychologists, as well as classroom teachers and teaching assistants. Each administration took approximately five minutes to complete per class. Probes were scored immediately following administration. To ensure consistency across administration and scoring, the same raters administered and scored each classroom on various benchmarks.

The basic instructions to the students were as follows: "First, I will read a sentence, and then you will write a story about what happens next. You will have one minute to think about what you will write, and three minutes to write your story. Remember to do your best work. If you don't know how to spell a word, you should guess. Are there any questions? (Pause). Put your pencils down and listen. For the next minute, think about ... (insert story starter)." After 30 seconds of "thinking," the examiner said, "you should be thinking about (insert story starter)." After this one-minute period, the examiner said, "Now begin writing." At the end of the three-minute writing period, the students were asked to stop writing and to put their pencils down. Each time interval was carefully monitored with a stop watch. Full instructions can be found in Appendix D (Powell-Smith & Shinn, 2004).

According to scoring guidelines from AIMSweb (Powell-Smith & Shinn, 2004), each student's response was scored for TWW and CWS. TWW scores are simply the total number of words the student wrote. This score accounts for any group of letters separated by a space, even if they are misspelled. One CWS is “two adjacent writing units (words and punctuation) that are correct within the context of what is written” (Powell-Smith & Shinn). This score takes into account spelling, capitalization, syntax, semantics, and punctuation. In each writing sample these sequences were summed to equal an overall CWS.

Design and Data Analysis

The current study is a causal-comparative cross-sectional design with gender as the independent variable and scores on the writing measure as the dependent variables. Two-way repeated measures analyses of variance were used to determine significance across genders for each score at each grade level. The within-subject variable was the actual score the student achieved on the WE-CBM probe at the fall, winter, and spring benchmarks and the between-subject variable was gender. We expected to find a significant effect across genders for WE-CBM scores at each grade level. It also was expected that these effects would be in favor of females at each grade level. Effect sizes also were calculated for gender differences using partial eta squared. The square root of partial eta squared was calculated and then compared to the qualitative categories defined by Cohen (1988): 0.01 = small, 0.06 = medium, and 0.14 = large.

Results

A total of twelve analyses were conducted, yielding twelve significant differences in WE-CBM scores in favor of females. Results of these bivariate analyses indicated that there were significant differences between genders in both scoring indices (TWW and CWS) at each grade level. Table 3 provides a summary of the gender differences found in the current study.

Third Grade Sample

Table 4 provides the summary statistics (*N*, *M*, and *SD*) and numeric differences for TWW data for male and female third grade students. Figure 1 displays a graphic illustration of the average changes in these scores. Visual analysis of Table 4 shows that in the fall, females scored an average of 4.37 TWW higher than males. Both groups made improvements when assessed again in the winter (an increase of 7.08 TWW for females and 4.62 TWW for males), with the mean female score surpassing the mean male score. Only females made further improvements when assessed in the spring (an increase of 4.28 TWW). On average, males' scores decreased 1.07 TWW from winter to spring benchmarks. When the final TWW measure was administered in third grade, females' average TWW score was higher than males' score by 12.18 TWW.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) serving as the within-subjects variable and gender (male, female) serving as the between-subjects variable was conducted for TWW in the third grade sample. The main effect of gender was significant in favor of females $F(1, 193) = 34.99$, $p < .001$. The effect size for this difference was .153, which is considered a large effect (Cohen, 1988). The main effect of time was also significant $F(1, 193) = 58.87$, $p < .001$. The effect size for time was .234 which also is considered large (Cohen, 1988). There was a significant interaction between gender and time $F(1, 193) = 16.17$, $p < .001$. The effect size for this interaction was .08 which is considered medium by Cohen's standards.

Table 4 displays the average CWS scores for third grade students from which the differences were computed. Figure 2 is a graphic illustration of the trends in these differences. Figure 2 depicts that, on average, females completed 2.52 CWS more than males in the fall. Both groups made improvements when assessed again in the winter (an increase of 6.75 CWS for females and 2.26 CWS for males), with the female mean score exceeding the males' mean score. Only females made further improvements when assessed in the spring (an increase of 4 CWS). Males' scores decreased 0.16 CWS from winter to spring benchmarks. When the final CWS measure was taken in the fall of third grade, the females' average CWS score was 11.17 CWS higher than the males' score.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) serving as the within subjects variable and gender (male, female) serving as the between-subjects variable was run for CWS in the third-grade sample. There was a significant main effect for gender in favor of females $F(1, 193) = 29.37$, $p < .001$. There was a medium effect size for this difference of .132 (Cohen, 1988). The main effect of time also was significant $F(1, 193) = 53.06$, $p < .001$. The effect size for time was .216, which is considered large (Cohen). A significant interaction between gender and time also was found $F(1, 193) = 24.09$, $p < .001$. The effect size for this interaction was .111, which is considered a medium effect (Cohen, 1988).

Fourth Grade Sample

TWW numeric scores for male and female fourth-grade students on average are displayed by Table 5. Figure 3 graphically depicts the differences in these scores. In Figure 3, visual analysis shows that in the fall, females scored an average of 7.45 TWW higher than males. Both groups made improvements when assessed again in the winter (an increase of 0.85 TWW for females and 3.94 TWW for males), with the mean female score higher than the male score. Similar to third grade findings, only females made further improvements when assessed in the spring. Females regained the advantage (an increase of 1.42 TWW) and males' scores decreased by 4.35 TWW. When the final TWW measure was taken in fourth grade, the females' average TWW score was higher than the males' score by 10.13 TWW.

A two-way repeated-measures ANOVA was run with the within subjects variable of time of year (fall, winter, spring) and the between subjects variable of gender (male, female) for TWW in the fourth grade sample. The main effect of gender was significant in favor of females $F(1, 218) = 24.96$, $p < .001$. The effect size for this difference was .103, which is considered a medium effect (Cohen, 1988). The main effect of time was not significant $F(1, 218) = .914$, $p > .05$, and there was not a significant interaction between gender and time.

Table 5 shows the average CWS scores for fourth grade male and female students. Figure 4 demonstrates a graphic illustration of the differences in these scores. At the fall benchmark, females completed 7.59 CWS more than males on average. In the winter, both groups made improvements when assessed again (an increase of 1.69 CWS for females and 3.08 CWS for males), with the average female score remaining higher than the average male score. Only females made further improvements when assessed in the spring (females made an increase of 3.09 CWS). The average males' score decreased by 1.73 CWS from winter to spring benchmarks. When the final measure of CWS was taken in the spring of fourth grade, the females' average CWS score was higher than the males' score by 11.02 CWS.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) serving as the within subjects variable and gender (male, female) serving as the between-subjects variable was run for CWS in the fourth grade sample. The main effect of gender was significant in favor of females $F(1, 201) = 26.86$, $p < .001$, with an effect size of .118, which is considered a medium effect (Cohen, 1988). There was also a significant main effect of time $F(1, 201) = 10.383$, $p = .001$. The effect size for time was .049, which is considered small (Cohen). There was not a significant interaction between gender and time.

Fifth Grade Sample

Table 6 displays the average TWW data for male and female fifth-grade students. Figure 5 graphically portrays the trends of the differences in scores. Visual analysis of Figure 5 shows that in the fall, females scored an average of 10.54 TWW higher than males. Both groups made increases when assessed again in the winter (an improvement of 1.55 TWW for females and 2.87 TWW for males), with female scores continuing to exceed male scores. Neither males nor females made improvements when assessed in the spring (females decreased by 1.8 TWW and male scores decreased by 1.51 TWW from winter to spring benchmarks). When the final TWW measure was taken in fifth grade, the females' average TWW score was 8.93 TWW higher than the males' score.

Using time of year (fall, winter, spring) as the within subjects variable and gender (male, female) as the between subjects variable, a two-way repeated-measures ANOVA was run for TWW in the fifth-grade sample. The main effect of gender was found to be significant in favor of females $F(1, 262) = 47.75$, $p < .001$. The effect size for this difference was .154, which is considered a large effect (Cohen, 1988). The main effect of time was not significant $F(1, 262) = .38$, $p < .05$. There was also not a significant interaction between gender and time.

The average CWS scores for male and female fifth-grade students is displayed by Table 6. Figure 6 is a graphic illustration of the differences in these scores. Figure 6 shows that in the fall females scored an average of 11.65 CWS higher than males. There were increases by both groups when assessed again in the winter (an increase of 3.97 CWS for females and 3.61 TWW for males), with the average female score topping the average male score. Only males made improvements when assessed in the spring (an increase of .68 CWS) and the mean female score decreased by a small margin of .031 CWS. When the final WE-CBM measure was taken in fifth grade, the females' average CWS score was higher than the males' score by 11.3 CWS.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) serving as the within subjects variable and gender (male, female) serving as the between-subjects variable was run for CWS in the fifth-grade sample. Again, the main effect of gender was significant in favor of females $F(1, 263) = 52.2$, $p < .001$. The effect size for this difference was .166, which is considered a large effect (Cohen, 1988). The main effect of time also was significant $F(1, 263) = 20.52$, $p < .001$. The main effect of .072 is considered medium (Cohen). A significant interaction between gender and time was not found.

Sixth Grade Sample

Table 7 displays the average sixth-grade TWW data for male and female students. Figure 7 graphically depicts the trend in these score differences. Table 7 shows that in the fall, females scored higher than male students by an average of 9.44 TWW. In the winter, both groups made improvements when assessed again (an increase of 4.59 TWW for females and 5.61 TWW for males), with the mean female score higher than the male score. Both males and females bettered their scores in the spring, with an increase of 4.55 TWW for females and .67 TWW for males, with female scores higher than male scores. When the final TWW measure was taken in sixth grade, the females' mean TWW score was higher than the males' score by 12.3 TWW.

Using the time of year (fall, winter, spring) as the within subjects variable and gender (male, female) as the between subjects variable, a two-way repeated-measures ANOVA was run for TWW in the sixth-grade sample. There was a significant main effect of gender in favor of females $F(1, 209) = 38.47$, $p < .001$. There was a large effect size for this difference of .155 (Cohen, 1988). The main effect of time also was significant $F(1, 209) = 59.33$, $p < .001$. The effect size for time was .221, which also is considered large by Cohen. There was no significant interaction between gender and time.

Figure 8 illustrates the average CWS data for male and female sixth-grade students. Table 7 provides the summary statistics (*N*, *M*, and *SD*) of these data. As shown in Figure 8, in the fall, females scored an average of 10.61 CWS higher than males. At the winter benchmark both groups made improvements when assessed again (an increase of 2.49 CWS for females and 3.19 CWS for males), with the average female score surpassing the average male score. Again in the spring, both males and females made improvements (an increase of 4.94 CWS for females and an increase of 3.33 CWS for males). When the final WE-CBM measure was taken in sixth grade, the average female CWS score was higher than the average male score by 11.52 CWS.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) functioning as the within subjects variable and gender (male, female) functioning as the between-subjects variable was run for CWS in the sixth-grade sample. As with the other samples, the main effect of gender was significant in favor of females $F(1, 209) = 37.61$, $p < .001$. This was a large effect size of .153 (Cohen, 1988). The main effect of time also was significant $F(1, 209) = 48.64$, $p < .001$. This effect size was .189, which is considered large (Cohen). However, there was not a significant interaction between gender and time.

Seventh Grade Sample

For seventh grade male and female students, Figure 9 represents the trend in TWW data. See Table 8 for the average seventh grade scores. In the fall, females scored an average of 12.13 TWW higher than males, as seen in Figure 9. Improvements were made by both groups when assessed again in the winter (an increase of 1.98 TWW for females and 2.39 TWW for males), with the mean female score above the male score. Again in the spring, both males and females made improvements (an increase of 7.96 TWW for females and an increase of 2.46 TWW for males). When the final WE-CBM measure was taken in seventh grade, there was an average difference of 17.22 TWW in male and female scores with females having the advantage.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) functioning as the within subjects variable and gender (male, female) functioning as the between-subjects variable was run for TWW in the seventh grade sample. The main effect of gender was significant in favor of females $F(1, 204) = 63.93$, $p < .001$. The effect size for this difference was .239, which is considered a large effect (Cohen, 1988). The main effect of time also was significant $F(1, 204) = 26.88$, $p < .001$. According to Cohen, the effect size of .116 for this difference is medium. The interaction between gender and time was not significant.

Table 8 displays the average CWS data for male and female seventh-grade students. Figure 10 is a graphic representation of the differences in these scores. Visual analysis of Figure 10 shows that in the fall females scored an average of 13 CWS higher than males. Both groups made improvements when assessed again in the winter (an increase of 3.01 CWS for females and 3.15 CWS for males), with the mean female score surpassing the male score mean. Both groups increased their scores from the winter to spring benchmarks as well (an increase of 10.76 CWS for females and 4.08 CWS for males), with the female score continuing to surpass the average male score. When the final CWS measure was taken in seventh grade, the females' average CWS score was higher than the males' score by 19.54 CWS.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) serving as the within subjects variable and gender (male, female) serving as the between-subjects variable was run for CWS in the seventh grade sample. The main effect of gender was significant in favor of females $F(1, 207) = 66.04$, $p < .001$. The effect size for this difference was considered large at .242 (Cohen, 1988). The main effect of time was also significant $F(1, 207) = 54.14$, $p < .001$. The effect size for time was .207, which is considered large (Cohen). There also was a significant interaction between gender and time $F(1, 207) = 5.25$, $p < .05$. The effect size was .025 which was considered small (Cohen).

Eighth Grade Sample

Table 9 depicts the TWW data for male and female eighth-grade students on average. Figure 11 is a graphic illustration of the trends in these scores. In the fall, females scored an average of 8.86 TWW higher than males. Both groups made improvements when assessed again in the winter (an increase of 2.85 TWW for females and 3.5 TWW for males), with the average female score surpassing the male score. In the spring, both male and female scores increased from the winter benchmark as well (an increase of 15.11 TWW for females and 9.32 TWW for males), with the mean female score continuing to surpass the male score mean. When the final TWW measure was taken in eighth grade, the females' average TWW score was higher than the males' score by 14 TWW.

A two-way repeated-measures ANOVA was run with the time of year (fall, winter, spring) serving as the within subjects variable and gender (male, female) serving as the between-subjects variable for TWW in the eighth grade sample. The main effect of gender was significant in favor of females $F(1, 138) = 19.04$, $p < .001$. The effect size for this difference was .121, which is considered medium (Cohen, 1988). The main effect of time was also significant $F(1, 138) = 64.32$, $p > .001$. The effect size for this difference was large at .318 (Cohen). There was not a significant interaction between gender and time.

Table 9 provides the average CWS data for male and female students in the eighth grade. Figure 12 graphically portrays the differences in these scores. Table 9 shows that, on average, females completed 10.85 CWS more than males in the fall. Both groups made improvements when assessed again in the winter (an increase of 3.09 CWS for females and 4.54 CWS for males), with the female score surpassing the mean male score. Both groups made further improvements when assessed in the spring (females made an increase of 16.1 CWS and males' scores increased 10.49 CWS on average from winter to spring benchmarks). When the final CWS measure was taken in the spring of eighth grade, females' average CWS score was higher than the males' score by 15.01 CWS.

A two-way repeated-measures ANOVA with time of year (fall, winter, spring) serving as the within subjects variable and gender (male, female) serving as the between-subjects variable was run for CWS in the eighth-grade sample. The main effect of gender was significant in favor of females $F(1, 139) = 20.82$, $p < .001$. The effect size for this difference was .13, which is considered medium (Cohen, 1988). The main effect of time also was significant $F(1, 139) = 72.21$, $p = .001$. The effect size for time was .342, which is considered large (Cohen). There was not a significant interaction between gender and time.

Discussion

This study extends previous research on gender differences in written expression by analyzing repeated measures of basic writing skills across grades 3-8. Significant gender differences in favor of females were apparent in the third-grade sample and continued through each grade level to the eighth-grade sample. Differences were found on each of the indices assessed (TWW and CWS). On average, female scores also increased significantly more than male scores from fall to winter to spring benchmarks within each grade sample. The gender differences found in favor of females in the current study are consistent with previous research findings (Jewell & Malecki, 2003; Jewell & Malecki, 2005). Specifically, females had higher average scores than males on all 18 benchmark assessments for both scoring indices. All 12 analyses yielded significant female advantages. There are several theories that may explain the female advantage found in this study and in previous research. Additionally, the pattern of gender differences found in the current study has theoretical implications.

The primary research question in this study investigated whether or not a female advantage would be found in CBM assessments of written expression in a sample of third through eighth grade students. Findings support the hypothesis that significant gender differences in written expression favoring females would be found across all assessed grade levels. The differences found in this study are consistent with the results of Berninger et al. (2008), who also found differences in written expression favored females. These researchers suggested that the differences could be due to a female advantage in orthographic skills or a difference in executive functioning. Orthographic skills are used to fluently encode verbal or written words into short-term memory. These skills also involve choosing the correct spelling of words. On average, females tend to be more efficient at these types of tasks. Berninger et al. also suggested that females are better able to inhibit irrelevant stimuli while carrying out reading and writing tasks.

The current study is also consistent with the findings of Jewell and Malecki (2003). These authors found gender differences in favor of females on each of the WE-CBM indices assessed in their sample. The overall differences found in the current study fall well below the .05 significance level, and the effect sizes of those differences were typically medium to large. Thus, the current study yielded large, meaningful differences favoring females.

Previous researchers have found a female advantage in early writing skills that is apparent as early as first grade (Jewell & Malecki, 2003; Jewell & Malecki, 2005). Gender differences found at an early age, particularly at the time when writing skills initially develop, lend support to physiological-maturational theories, which suggest that innate differences between males and females could lead to disparities in writing skills (Geschwind & Galaburda, 1987; Naour, 2001). However, differences that emerge in later grades would support societal or cultural theories. These theories purport that the school environment, curricular material, and/ or socialization processes might influence gender disparities in the development of written expression skill (Gibb et al., 2008; Meece et al., 2006; Ready et al., 2005). Significant differences in favor of females were found in the current study in the third-grade sample and these differences persisted through each grade to the eighth-grade sample. Thus, the pattern of differences found in this study lends support to both biological and socio-cultural theories. From a biological perspective, one might conclude that, because females out-performed males in the earliest grade and continued to do so throughout the other grades, the differences in performance are innate. However, it also is plausible that certain socialization processes that occurred prior to third-grade, such as parent and teacher instruction in reading, may have contributed to gender differences in third- through eighth-grade writing. Future research is needed to provide greater support for the specific theories that best account for the results.

Patterns of Gender Differences: Grade Level

The second question posed in this study asked if there is a specific age or grade at which gender differences begin to appear. The present findings support our hypothesis that gender differences are apparent and substantial in the beginning of third grade. However, the question cannot be fully answered because discrepancies in the third grade sample might suggest that gender differences in writing may begin at the beginning of third grade or differences might occur earlier than third grade.

Previous researchers have found that gender differences in writing increased or persisted as age or grade level increased (Berninger et al., 2008; Jewell & Malecki, 2003; Jewell & Malecki, 2005). The current results replicate the findings of past studies. At each grade level, females significantly outperformed males in terms of TWW and CWS. The differences in scores were both significant and meaningful. Differences also were found across the benchmark periods (fall to winter to spring) within some grade levels. For TWW, average female scores increased more than male scores at each grade, except for the fourth- and fifth-grade samples. The differences in increases were both significant and meaningful. Differences were found across all benchmark periods within every grade sampled for CWS. The differences in CWS increases were also significant and meaningful. The effect sizes found for benchmark periods within grade levels seem to follow the same pattern: there is a large effect across time in third grade, but this effect decreases or is not significant in fourth and fifth grade and then increases again in sixth through eighth grades.

Past research has suggested that gender differences in written expression occur as early as first grade (Jewell & Malecki, 2003) and even may be influenced by differences in prenatal development (Geschwind & Galaburda, 1987; Naour, 2001). The significant differences favoring females in the third-grade sample lend support to physiological-maturational theories. Unlike previous studies that included younger participants, third grade was the earliest age at which writing skills were measured in the current sample. Although the grade range of the current sample may seem to limit the support that can be given to biological theories, previous research has suggested that beginning in third grade, students can be accurately measured on more advanced writing skills that enable them to express themselves fluently in writing (Jewell & Malecki, 2003). Therefore, one would expect any differences to emerge around this age, despite the fact that they may be a result of testosterone levels present during language development of the brain (Geschwind & Galaburda; Naour). Our results do indicate that when students enter third grade, a time when most curricula begin to focus more intensely on writing skills, there is an apparent female advantage in writing.

While female scores tended to increase significantly more than male scores *within* each grade level, this significant increase was not seen *across* grade levels. In other words, the gender gap was apparent at the beginning of each grade level and this gap remained consistent, but did not widen according to grade level. For example, there was a large difference, relative to the sample, between female and male TWW scores at the seventh-grade level, but a smaller effect was found at the sixth- and eighth-grade levels. It should be noted that while the effect sizes were smaller for these grades, the sizes still remained in the medium to large effect size range. This particular outcome, that gender differences in writing did not increase with progressive grade levels, indicates that these differences may result more from biological differences than learned differences.

It should be noted that socio-cultural theories should not be completely eliminated based on current results. These theories purport that it is children's experiences with their environments, rather than differences in brain development that lead to gender differences. Gibb et al. (2008) suggested that gender differences in classroom behavior can influence male and female academic achievement. Boys are often described by their teachers as having more distractible, restless, and inattentive behaviors than females. These behaviors are viewed as negative by most classroom teachers (Gibb et al.). Based on this information, one could make the connection between differences in student behavior and differential treatment of male and female students in the classroom. The constant gender differences in writing found in the current study could support socio-cultural theories that student behavior or teaching differences account for differences in academics. While socio-cultural theories cannot be eliminated from these results, this rationale has less support than the biological theories.

In the current study, the pattern of differences that emerged did not vary by grade level, which lends some support to past research suggesting that biological differences between males and females are responsible for gender disparities in academic skills (Geschwind & Galaburda, 1987; Naour, 2001). However, since our youngest participants were in third grade, our findings provide only limited support to physiological theories.

Additional research with younger samples must be conducted before definitive conclusions can be drawn about the origins of gender differences in writing.

Patterns of Gender Differences: Specific Skill

The current study outcomes also support our hypothesis that gender differences would be found for each of the assessed indices. Specifically, the total words written scores showed significant gender differences in favor of females at each grade level. This finding indicates that, when prompted, females in grades three through eight wrote more words (correct or incorrect) than males in the same grades. In 2003, Jewell and Malecki found that females outperformed males on all written expression curriculum based measuremes. The findings from TWW scores in the current study support previous evidence that females produce more words in their writing than males.

Also, females tended to increase their TWW scores relative to male TWW scores throughout the year from fall to winter and winter to spring benchmarks. Specifically, female scores increased significantly compared to the increase in male scores in third, sixth, seventh, and eighth grades. In fourth and fifth grades, girls' average TWW scores did not improve more than boys' scores across the school year. The fact that boys and girls improved at different rates from third to eighth grades may offer support for socio-cultural theories of gender differences in the classroom. According to the theories proposed by Preckle et al. and Meece et al. (2006), motivational qualities may be involved in students' classroom performance and more specifically, their writing performance. Meece et al. suggest that motivational beliefs include competency, value, and self-efficacy beliefs and that students acquire these qualities through experience. In other words, a students' motivation in writing could influence their sense of competency in writing, the value they place on writing, and the overall confidence they have in their writing skills. Meece et al. found that gender differences in motivational qualities matched gender differences in academic performance. According to these theories, the motivation of third, sixth, seventh, and eighth grade female students in the current sample to write might have increased throughout each school year (i.e., from fall to winter to spring) more than male students' motivation because of the significant gender differences in student writing scores throughout these grades.

Other socio-cultural theories focus more on school factors, such as curriculum content or teaching strategies (Gibb et al., 2008). In many school districts, third grade is the first year in which the curriculum is intensely focused on writing. Since female students showed an advantage in written performance at the beginning of third grade, one might assume that past teaching strategies in writing were better suited for female students than for males. The similarities of improvement seen in boys versus girls in fourth and fifth grades might stem from the heavy focus on standardized assessment of writing in those grades. These assessments may cause teachers to employ many different approaches to writing instruction for all types of learners. On the other hand, in middle school grades, the majority of teachers transition to focus on the *meaning* of students' writing, rather than the *amount* of it. This change might account for the similarities in score differences throughout each school year during middle school.

Significant gender differences in favor of females also were found for CWS scores in third through eighth grade students. This difference supports our hypothesis that females would produce more correct writing sequences than males. The CWS differences found in this study corroborate previous studies that also found gender differences in written expression (Jewell & Malecki, 2003; Jewell & Malecki, 2005). Jewell and Malecki (2005) suggested that production dependent indices, such as TWW and CWS scores, would produce gender differences in favor of females. The current study clearly supports this hypothesis.

The observed gender differences in WE-CBM scores might stem from differences in the way that males and females communicate, both orally and on paper. Males tend to respond more directly to verbal or written stimuli, whereas females tend to respond more indirectly (LaFrance & Harris, 2004). In other words, male responses tend to be shorter and more to the point than female responses. Male responses may be equal in quality to female responses, but the number of words produced may be smaller. Clearly, these tendencies might help account for the gender gap in scores, although they could support either biological or socio-cultural theories. From a biological standpoint, the communication differences could stem from innate temperamental differences, but a socio-cultural theorist likely would suggest differences in how parents and teachers treat girls and boys that lead to these communication differences.

Within each grade level, female CWS scores increased more than male scores across the fall, winter, and spring benchmarks. Females' scores were significantly higher than males' in samples at each grade level. These findings suggest that in the fall, female students wrote more correct writing sequences and increased these writing sequences significantly more than males throughout the school year. These results are quite similar to those found for TWW scores. Much like those findings, this difference in the increase of scores supports a socio-cultural view of gender differences in writing. Gibb et al. (2008) suggests that learning and assessment procedures specific to individual schools may impact academic achievement in students and ultimately lead to gender differences. One might expect that these school factors would impact student performance throughout each school year, which could be a viable explanation for increasing gender differences.

Limitations and Directions for Future Research

In the future, it is imperative that researchers continue to study the development of gender differences in writing. The current study only assessed the student population from third through eighth grade. Due to the limited grade samples, it is difficult to draw specific developmental conclusions. Since differences in writing have been found as early as first grade (Jewell & Malecki, 2003), future studies should include younger students to examine more thoroughly the development of these skills in girls and boys. However, assessing writing skills of younger participants may be difficult due to the nature of the development of writing. The current study examined advanced writing skills in the production of words and the fluency of writing rules. These advanced measures may not be appropriate for younger students who have not yet mastered such skills. Nevertheless, future research is still necessary to investigate the development of writing and how gender differences may unfold during the acquisition of writing skills. Researchers should focus on particular prerequisite writing skills with younger children. Previous findings have suggested that reading and writing development and performance in the classroom are closely related (Berninger et al., 2006). Future research should focus on the similarities in development between reading and writing skills so that comparisons might be made about the development of one skill in terms of the other. For example, it may be more appropriate to assess first-grade students in reading rather than writing since reading instruction is so much more intensive than writing instruction in first grade. If researchers can make predictions for writing performance based on reading, they may discover more specific developmental information in the field of writing.

The current study assessed students with production-dependent indices only. Jewell and Malecki (2003) found that females outperformed males using both production-dependent and production-independent indices. However, in 2005, the same researchers measured a different population of students and found significant gender differences on production-dependent indices, but no significant gender differences on production-independent indices. The research in 2003 and 2005 by Jewell and Malecki provides the only previous evidence of gender differences on WE-CBM. The current results support and extend the production-dependent findings of both studies with a different population of students. Although past and current research supports gender differences in fluency measures, future research is needed to investigate gender differences in the accuracy of students' writing. These findings may help educators be better prepared to teach writing skills to both the male and female students.

The current study was carried out through the use of a cross-sectional design. In the future, a longitudinal study that tracks the same students as they progress through grades would allow more conclusive findings about differences in writing skills and how they develop in boys and girls. More definite recommendations could be made about how teachers can help males and females develop these writing skills. The current study also measured student performance from a small, rural, and non-diverse school district. It is imperative that these differences be measured with a larger sample size that is more representative of the national student population.

Implications for Practice

Past researchers have theorized that gender differences will affect students' performance in the classroom (Ackerman, 2006; Gibb et al., 2008; Freeman, 2004). It is important that educational practitioners be aware of the specific academic areas in which these gender differences occur. The current study found gender differences in writing. It might be necessary for educators to focus more intensely on writing for males in the classroom. It also may be essential that more varied learning strategies in writing are offered for students, especially male students, in order to accommodate for these gender differences. For example, male students may perform better at sequential processing tasks as opposed to tasks that require planning and attention (Naglieri & Rojahn, 2001). Providing students with more concrete processes in writing throughout development could improve male learning strategies overall in writing.

One also must consider the possible outcomes of these gender differences in the classroom. For example, Gibb et al. (2008) suggests that males have more disruptive behaviors in the classroom. Behavioral gender differences might stem from biological differences or from male frustration in the classroom. Considering that behavior problems may be increased by frustration, teachers might focus their efforts towards the academic success of males rather than the behaviors themselves. Motivational qualities have been cited as one of the variables related to gender differences in academic achievement (Meece et al., 2006). With respect to past research, educators also might concentrate their efforts on students' motivation as a more indirect influence on student outcomes. For example, a male with higher motivation to do well in the classroom, specifically in writing, may actually perform better than a male who is poorly motivated in writing.

In addition to supporting socio-cultural theories, the findings of the current study also suggest that gender differences in writing could be biological in nature. Educators should be aware of these possible biological differences and should alter instruction in the classroom to accommodate various learning styles in all academic areas. For example, in 2001, Naour suggested that males may struggle more than females with auditory stimuli. However, males are more prone to respond to visual stimuli than females. This theory suggests the need for educators to provide equal visual and auditory learning opportunities.

Many school systems are now using CBM assessments and tools to make informed decisions about students' performance and progress in different academic areas in the classroom. The decisions made from CBM outcomes can influence the resources available to students and the level of instruction offered to them. These evaluations are commonly used in schools implementing Response to Intervention (RtI) methodologies. There are a number of conclusions that can be made from the current results relevant to the use of WE-CBM assessments in schools. It is important that educational practitioners are aware of the gender differences found with CBM in writing. Since CBMs are grounded in the curriculum, results are telling of the students' performance in the classroom. Practitioners should be aware that, due to the nature of CBM decision making and these gender differences, males may receive more resources and instructional time in writing than females. This is especially true in schools implementing RtI, as students who perform below a certain standard on CBM assessments are targeted to receive more instructional focus and time in that academic area. Ultimately, a student's performance on CBM will be the basis of a specific learning disability diagnosis in schools adhering to a RtI decision making model. If practitioners in these school systems are not fully aware of the potential for females to score higher on these assessments, males could be over-identified as having learning disabilities in writing. The results of this study suggest that it may be necessary to create separate norms for male and female students. On the other hand, separate norms might influence teachers' expectations for their students. Taking into consideration these major decisions in the schools, the importance of being fully aware of the limitations of CBM is clear.

Practitioners also should take into consideration different possible teaching and learning strategies for writing. For example, if a child is struggling in writing compared to his classmates, offering different methods to organize writing may be appropriate. For boys, such different instructional methods might include more visual strategies and taking into account possible biological gender differences in the brain (Naour, 2001).

Although specific developmental conclusions cannot be made, it is important for educators to be aware of specific gender differences in writing performance in the classroom. Teachers and other education professionals should note that, on average, males write less than females. This finding suggests that certain grading systems for writing may be more reasonable than others. For example, if students are only graded by the total words written, this may present a disadvantage for many male students. Educators who pay more attention to the meaning of each student's writing, rather than the amount written, may be offering a more level playing field for males and females.

The current study found overall gender differences in WE-CBM assessments. On average, female students in grades three through eight performed better than male students on these written expression measures. The results indicate that the differences were significant and steady across grade levels. There were no specific grade or age patterns in these differences. Females tended to produce more words and use these words in more correct sequences than males in the allotted time.

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Appendix A

Appalachian STATE UNIVERSITY

INSTITUTIONAL REVIEW BOARD
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To: Jamie Fearrington
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Boone, NC 28608

From: ______________________________
Jay Cranston, M.D., Chair, Institutional Revew Board

Date: 9/03/2008

RE: Determination that Research or Research-Like Activity does not require IRB Approval

Study #: 09-0033 Study Title: Gender Differences in Written Expression Curriculum-Based Measurement

This submission was reviewed by the IRB. It was determined that this submission does not constitute human subjects research as defined under federal regulations [45 CFR 46.102 (d or f)] and does not require IRB approval. If your study protocol changes in such a way that this determination will no longer apply, you should contact the above IRB before making the changes.

CC:
Patricia Dilger

Appendix B

Monroe County Department of Education

MICHAEL L. LOWRY
Director of Schools
205 Oak Grove Road
Madisonville, TN 37354
Telephone: (423) 442-2373
Fax: (423) 442-1389

5-13-2008

To Whom It May Concern:

The purpose of this letter is to grant researchers from Appalachian State University permission to disseminate data that were collected in our system during the 2003-2004, 2005-2006, 2006-2007, 2007-2008, and 2008-2009 school years. It is our understanding that these data were gathered as routine academic screenings and may include benchmark scores, progress monitoring scores, and other standardized test scores. Furthermore, we understand that no specific names of students, teachers, or schools will be communicated. Any other potential identifiers will be removed before these data are disseminated. We grant full permission to the researchers to disseminate these data via publication and presentation. Please do not hesitate to contact me if you have further questions.

Sincerely,

Mike Lowry
Director of Schools
Monroe County School System

Appendix C

Name:____________________________________
Grade:____________________________________
Homeroom Teacher:__________________________

If I were to make a TV show, it would be about …

Appendix D

Written Expression Curriculum-Based Measurement (WE-CBM) Standardized Directions

1. Select an appropriate story starter.
2. Provide the student with a pencil and a sheet of lined paper.
3. Say these specific directions to the students:

"You are going to write a story. First, I will read a sentence, and then you will write a story about what happens next. You will have 1 minute to think about what you will write, and 3 minutes to write your story. Remember to do your best work. If you don't know how to spell a word, you should guess. Are there any questions? (Pause) Put your pencils down and listen.

For the next minute, think about ... "(insert story starter)."

4. After reading the story starter, begin your stopwatch and allow 1 minute for students to "think." (Monitor students so that they do not begin writing).

   After 30 seconds say: ***"You should be thinking about…*** "(insert story starter)."

5. At the end of 1 minute say: ***"Now begin writing."*** Restart your stopwatch.
6. Monitor students' participation. If individual students pause for about 10 seconds or say they are done before the test is finished, move close to them and say ***"Keep writing the best story you can."*** This prompt can be repeated to students should they pause again.
7. After 90 seconds say: ***"You should be writing about*** (insert story starter)."

At the end of 3 minutes say: ***"Stop. Put your pencils down."***

(WE-CBM) Standardized Directions

Table 1

Participant Numbers per Grade

Grade Level	Gender		Total
	Male	Female	
Third	95	100	195
Fourth	103	117	220
Fifth	131	134	265
Sixth	101	110	211
Seventh	104	105	209
Eighth	66	74	140
Total	600	640	1240

Table 2

Sample Characteristics

Ethnicity	Percentage of Participants
Caucasian	94.4
African American	1.4
Asian American	0.5
American Indian	0.3
Hispanic	3.4

Table 3

Summary of Significant Differences on CWS and TWW by Grade

Grade	CWS F	Effect Size	TWW F	Effect Size
Third	29.37*	.132	34.99*	.153
Fourth	26.86*	.118	24.96*	.103
Fifth	52.2*	.166	47.75*	.154
Sixth	37.61*	.153	38.47*	.155
Seventh	66.04*	.242	63.93*	.239
Eighth	20.816*	.130	19.04*	.121

(*) denotes a significant gender differences of $p = .000$. All significant differences indicate a female advantage.

Table 4

Descriptive Statistics for Third Grade TWW and CWS Scores

Benchmark Period	Gender	*N*	TWW		CWS	
			M	*SD*	*M*	*SD*
Fall	Male	95	19.83	10.85	13.22	9.77
	Female	100	24.20	11.32	15.74	11.37
Winter	Male	95	24.45	10.97	15.48	9.06
	Female	100	31.28	12.06	22.49	11.24
Spring	Male	95	23.38	10.84	15.32	9.75
	Female	100	35.56	13.91	26.49	13.51

Table 5

Descriptive Statistics for Fourth Grade TWW and CWS Scores

Benchmark Period	Gender	*N*	*TWW*		*CWS*	
			M	*SD*	*M*	*SD*
Fall	Male	95	30.39	13.00	22.69	13.16
	Female	100	37.84	14.46	30.28	13.74
Winter	Male	95	34.33	12.89	25.77	11.71
	Female	100	38.69	13.90	31.97	14.70
Spring	Male	95	29.98	12.39	24.04	12.71
	Female	100	40.11	13.34	35.06	14.42

Table 6

Descriptive Statistics for Fifth Grade TWW and CWS Scores

Benchmark Period	Gender	TWW			CWS		
		N	*M*	*SD*	*N*	*M*	*SD*
Fall	Male	130	35.78	12.00	131	28.31	13.65
	Female	134	46.32	13.49	134	39.96	14.26
Winter	Male	130	38.65	14.08	131	31.92	15.61
	Female	134	47.87	15.56	134	43.93	17.67
Spring	Male	130	37.14	15.80	131	32.60	16.95
	Female	134	46.07	13.48	134	34.90	14.69

Table 7

Descriptive Statistics for Sixth Grade TWW and CWS Scores

Benchmark Period	Gender	*N*	*TWW*		*CWS*	
			M	*SD*	*M*	*SD*
Fall	Male	101	31.54	12.17	26.87	12.32
	Female	110	40.98	14.77	37.48	16.60
Winter	Male	101	37.15	13.84	30.06	14.61
	Female	110	45.57	15.59	39.97	16.06
Spring	Male	101	37.82	14.89	33.39	14.91
	Female	110	50.12	17.45	44.91	17.81

Table 8

Descriptive Statistics for Seventh Grade TWW and CWS Scores

Benchmark Period	Gender	TWW			CWS		
		N	*M*	*SD*	*N*	*M*	*SD*
Fall	Male	103	38.18	14.17	104	34.80	15.71
	Female	103	50.31	14.69	105	47.80	15.30
Winter	Male	103	40.57	16.64	104	37.95	16.38
	Female	103	52.29	16.73	105	50.81	17.59
Spring	Male	103	43.03	20.43	104	42.03	21.24
	Female	103	60.25	16.76	105	61.57	18.59

Table 9

Descriptive Statistics for Eighth Grade TWW and CWS Scores

Benchmark Period	Gender	*N*	*TWW*		*CWS*	
			M	*SD*	*M*	*SD*
Fall	Male	66	43.29	14.43	41.23	16.26
	Female	74	51.15	14.49	52.08	16.22
Winter	Male	66	46.79	19.78	45.77	20.44
	Female	74	55	14.09	55.17	14.55
Spring	Male	66	56.11	22.71	56.26	24.57
	Female	74	70.11	22.58	71.27	24.62

Figure Caption

Figure 1. Gender differences across time in third grade TWW scores.

Figure 2. Gender differences across time in third grade CWS scores.

Figure 3. Gender differences across time in fourth grade TWW scores.

Figure 4. Gender differences across time in fourth grade CWS scores.

Figure 5. Gender differences across time in fifth grade TWW scores.

Figure 6. Gender differences across time in fifth grade CWS scores.

Figure 7. Gender differences across time in sixth grade TWW scores.

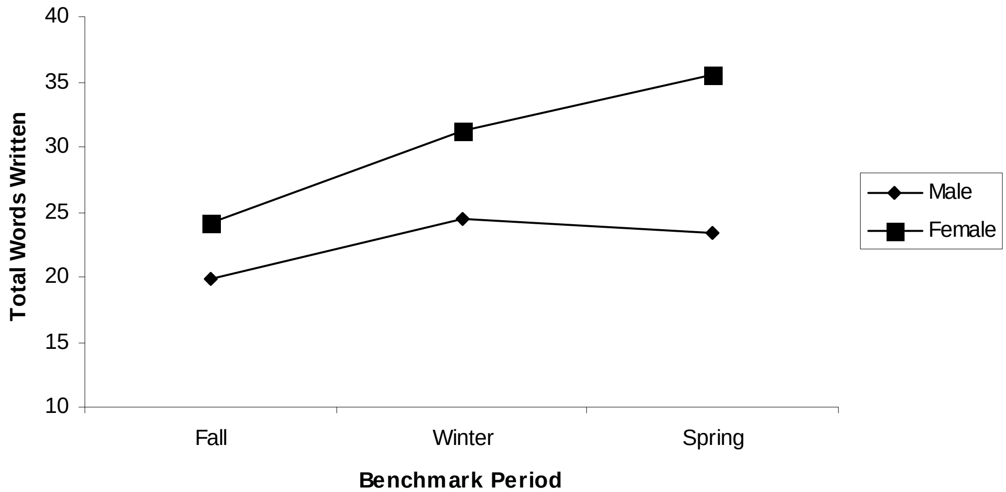
Figure 8. Gender differences across time in sixth grade CWS scores.

Figure 9. Gender differences across time in seventh grade TWW scores.

Figure 10. Gender differences across time in seventh grade CWS scores.

Figure 11. Gender differences across time in eighth grade TWW scores.

Figure 12. Gender differences across time in eighth grade CWS scores.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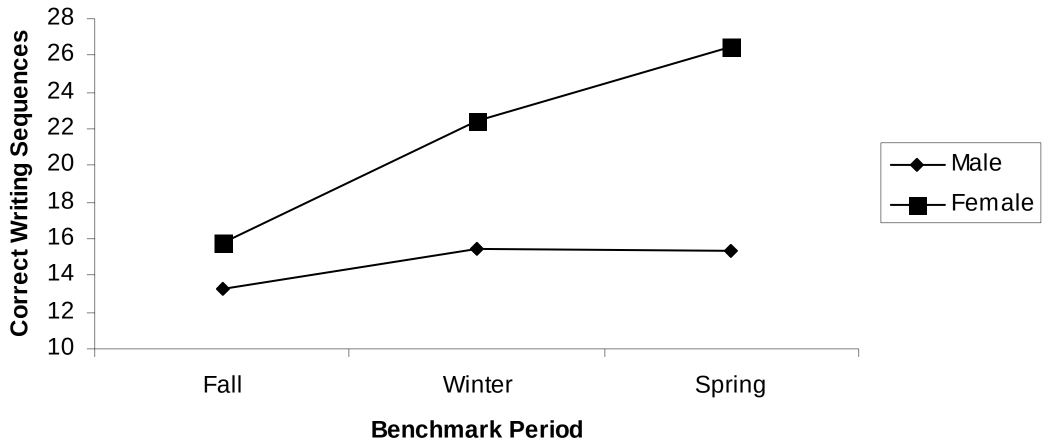
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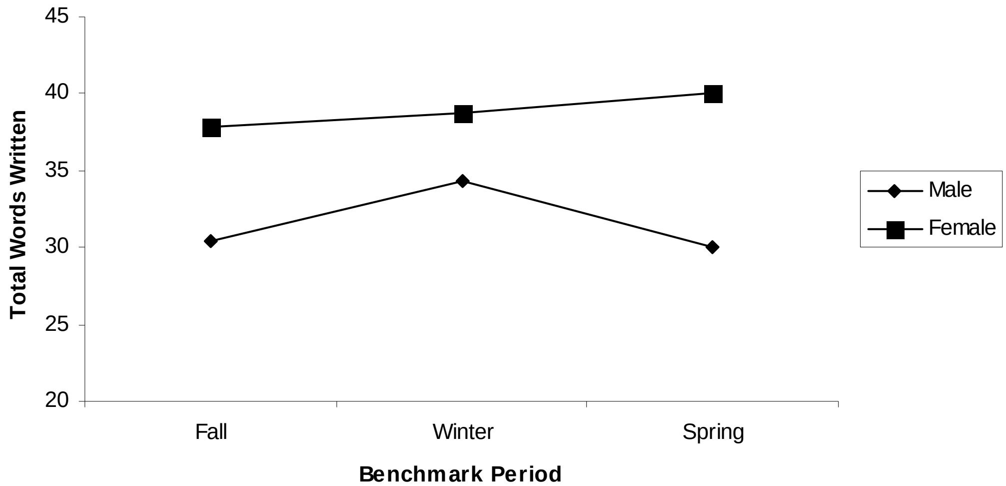
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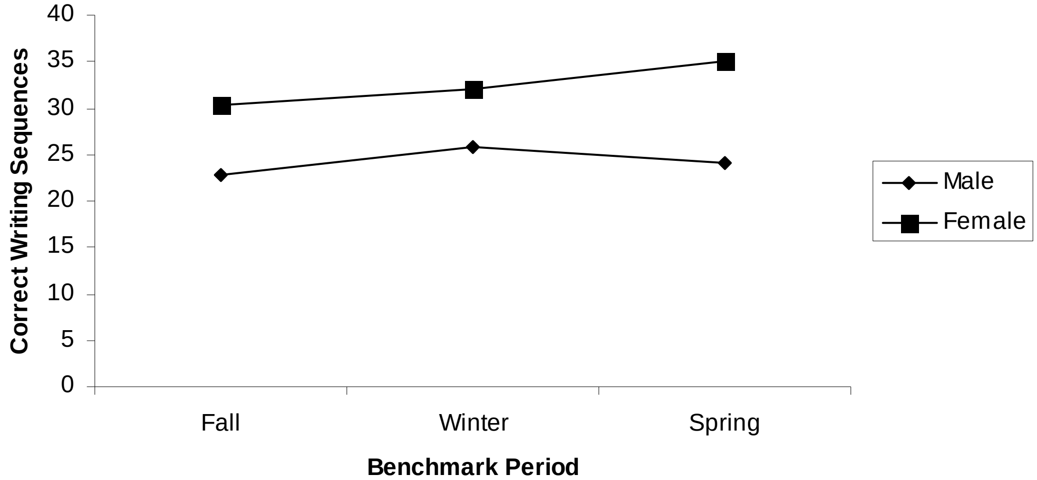
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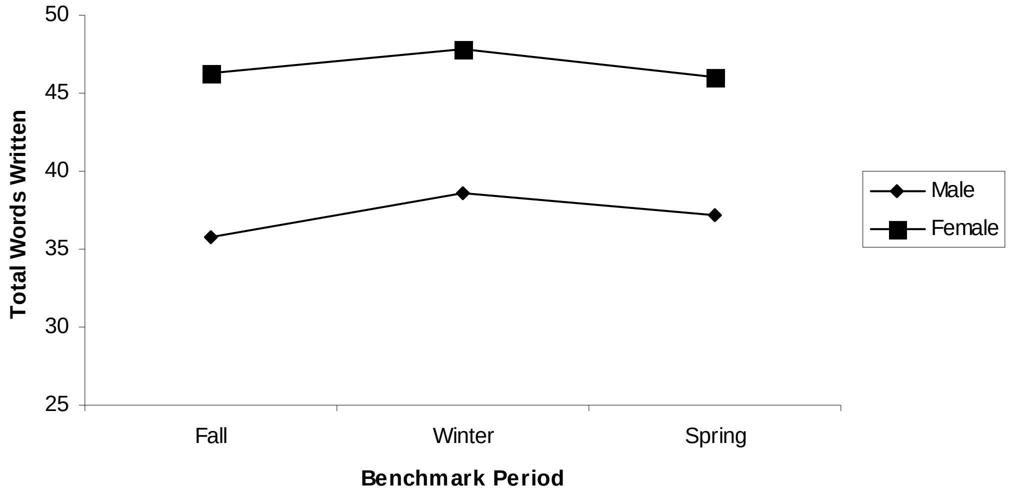
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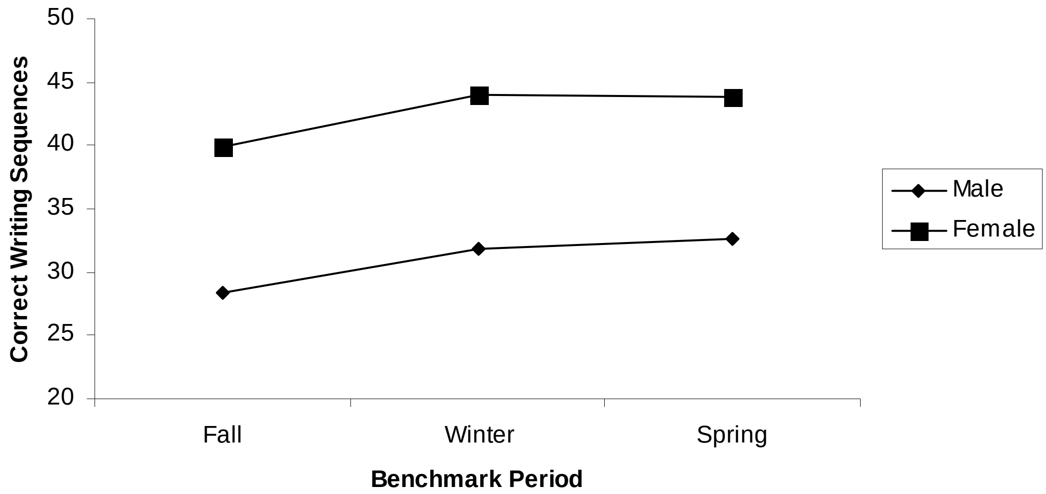
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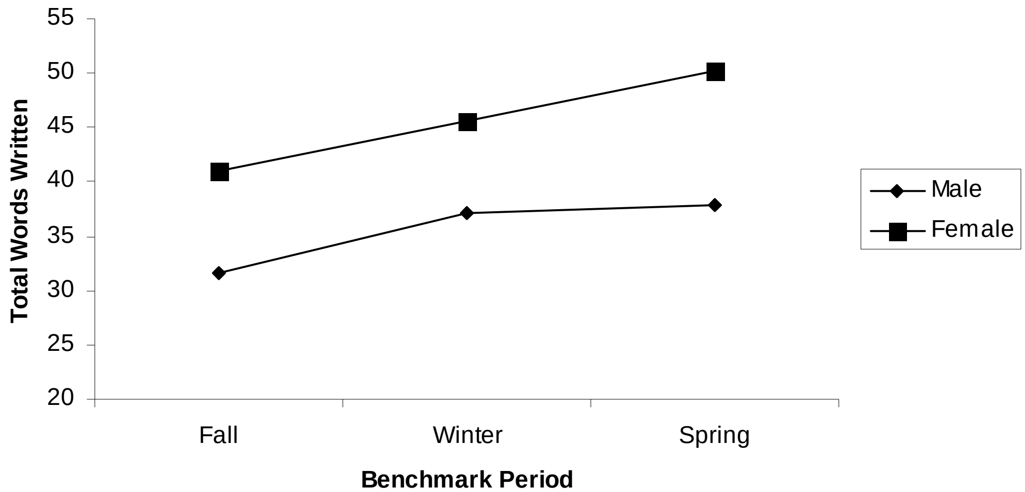
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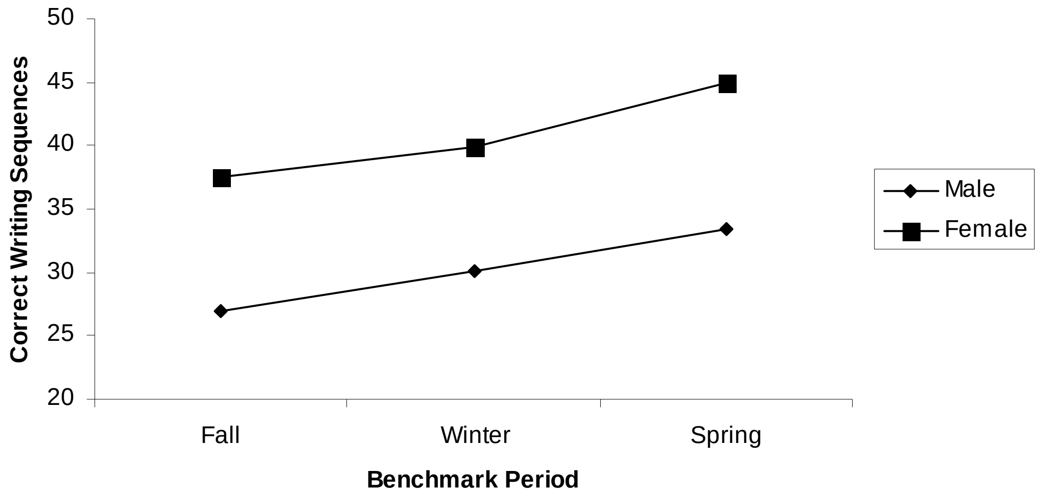
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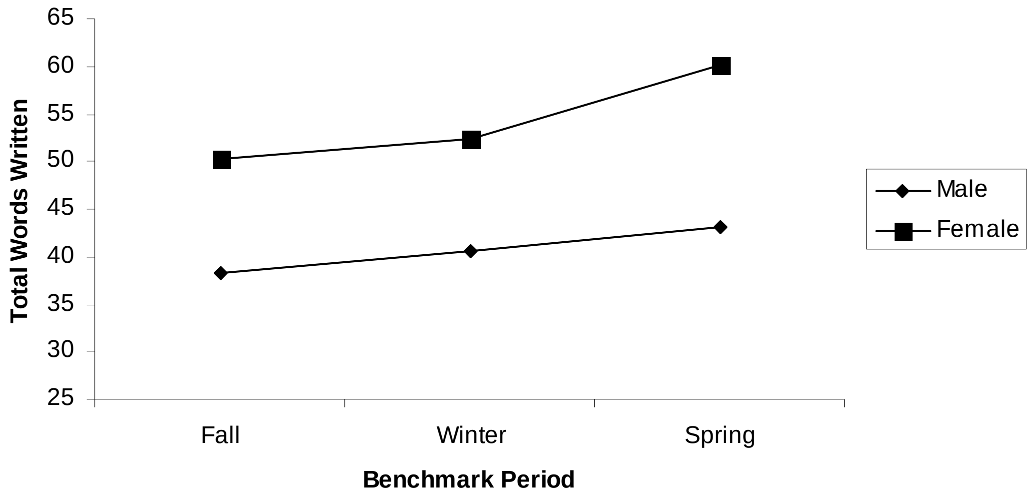
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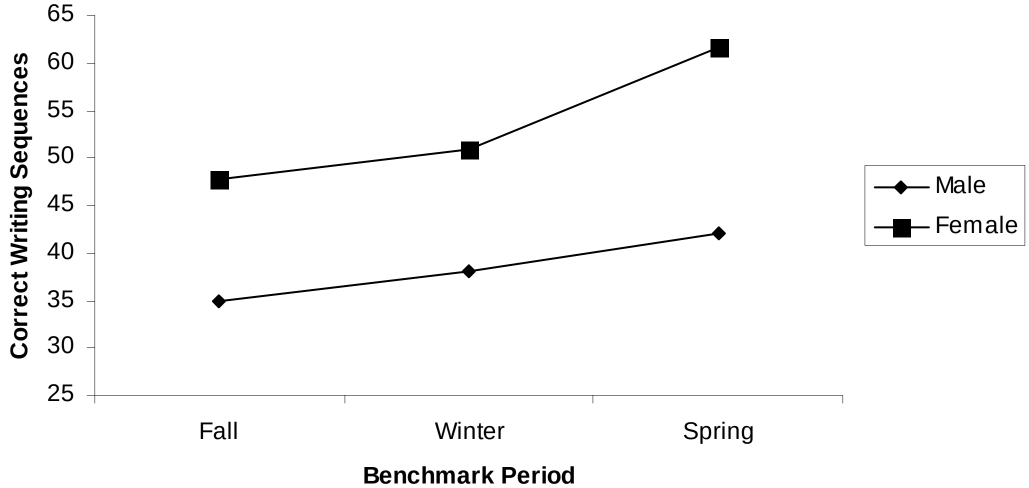
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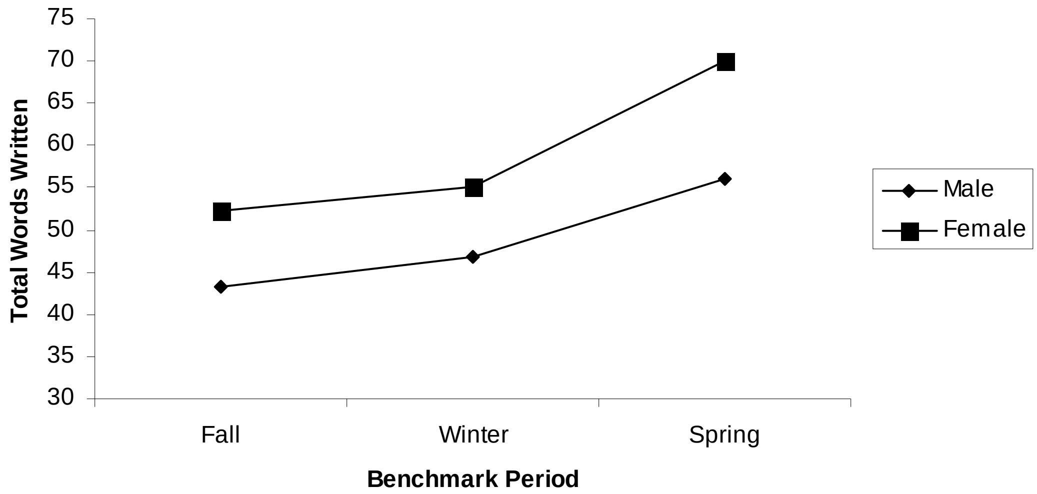
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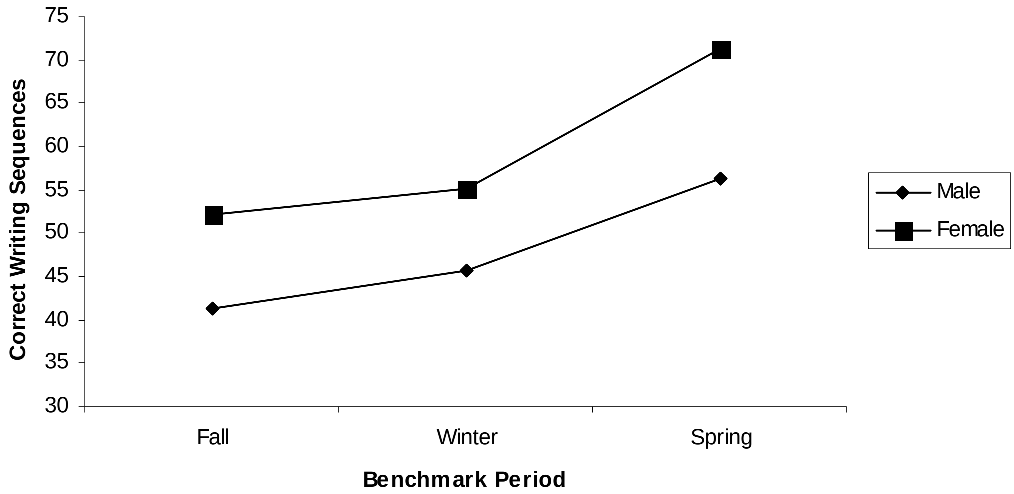
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Correct Writing Sequences
Fall
Winter
Spring
Benchmark Period
Male
Female

VITA

Patricia Dilger Parker was born in Raleigh, NC, on August 5, 1985. She attended Wake County Public Schools and graduated from Wakefield High School in 2003. The following autumn, she entered the University of Mary Washington and in May 2007 she was awarded a Bachelor of Science degree in Psychology. In the spring of 2007, Mrs. Parker accepted a graduate position in School Psychology at Appalachian State University and began to study toward a Master of Psychology and a Specialist in School Psychology degree. During the 2009-2010 academic year, she served as a school psychology intern in the Alexandria City Public School district. Upon completion of her internship, she will be awarded her degree in May 2010.

Mrs. Parker's home address is 100 Century Drive, Alexandria, VA. Her parents are Mr. Stephen E. Dilger and Mrs. Nancy B. Dilger. On August 16, 2008, she and Mr. Dale T. Parker were married.