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Curriculum-Based Measures of Writing for High School Students

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The purpose of this study was to determine whether technically adequate curriculum-based measures of writing could be identified for use with high school students. The participants included 10th-grade general and special education students from two public school districts in Wisconsin. Students (n = 82) completed two narrative writing samples in response to story starters, and samples were scored for four alternative curriculum-based measures: incorrect word sequences (ICWS), correct punctuation marks (CPM), adverbs (ADV), and adjectives (ADJ). Results revealed moderately strong alternate-form reliability and criterion-related validity coefficients for ICWS. Although CPM was found to be reliable, the criterion-related validity evidence varied according to the type of criterion measure. Other findings indicated that ICWS and CPM cut scores may have utility for specific screening purposes. The curriculum-based measures of ADJ and ADV, however, were not found to have the technical adequacy needed for predictive purposes.

Keywords: *curriculum-based measurement; curriculum-based measures; writing assessment; written expression measures; high school writing assessment*

Writing is an important communication skill. Writing provides an outlet for expression, a method of reflection, and the means with which to record our history. Writing proficiency does not develop instantaneously; it is a process that adapts and changes with one's experiences and education. The importance of writing in today's society can be seen by its inclusion on graduation tests, on statewide achievement tests, on college entrance exams, and in the Nation's Report Card.

It is unfortunate that the National Assessment for Educational Progress results indicate that as many as 14% to 26% of our nation's students are not able to write at the most basic level (National Center for Educational Statistics, 2002). Writing difficulties are particularly prevalent among students with learning disabilities and for those classified as having attention-deficit/hyperactivity disorders (Graham & Harris, 2002; Graham, Harris, & Larsen, 2001; Harris & Graham, 1999; Lienemann, Graham, Leader-Janssen, & Reid, 2006; Re, Pedron, & Cornoldi, 2007). Given these findings, it should come as no surprise that identifying ways to assess and monitor writing proficiency is of great interest to both general and special educators. One way to assess writing proficiency and to monitor the developing writing skills of students is through curriculum-based measurement (CBM).

Curriculum-based measures are a standard set of measures used by educators to evaluate the academic performance of students in the basic skills of reading, mathematics, spelling, and written expression (Deno, 1985, 2003). Deno and his colleagues first developed CBM in the 1970s as a way for special education teachers to accurately assess and evaluate the effects of instruction (Deno, 1992). Since then, CBM has been applied to an array of situations and populations (Deno, 2003; Shinn, 1998). Although the

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primary purpose of CBM remains to provide teachers with a tool to help improve student performance (Stecker, Fuchs, & Fuchs, 2005), recent changes in federal law (i.e., No Child Left Behind Act of 2001 and Individuals with Disabilities Education Improvement Act of 2004) call for assessment tools like CBM to quickly and accurately screen for students who appear to be at risk for failing to meet academic standards.

Many characteristics make CBM ideal to evaluate student performance for both screening and progress monitoring purposes. Unlike traditional norm-referenced standardized tests of assessment, curriculum-based measures are simple, short-duration forms (i.e., 10 minutes or less) of assessment related to the curriculum of interest (Deno, 1985, 2003). Curriculum-based measures are available in multiple forms. Multiple forms decrease the likelihood of practice effects, thus making frequent administration possible. CBM, therefore, provides teachers and other educators with a method to continually assess and monitor the academic growth of their students.

Teachers who use CBM are more likely to modify curricular programs, respond to student progress, and formulate realistic goals (Fuchs, Deno, & Mirkin, 1984; Fuchs, Fuchs, & Stecker, 1989). As a consequence, the use of curriculum-based measures can lead to higher achievement scores in reading, spelling, and mathematics when teachers incorporate CBM data-based decision rules, use CBM computer applications with embedded skills analyses, and follow instructional recommendations based on CBM data (Fuchs & Fuchs, 1986; Stecker et al., 2005).

Improvements on specific curriculum-based measures can be generalized to broader areas of achievement. For instance, the number of words read correctly in 1 minute has been proved to be a good indicator of a child's overall reading skill (Ardoin et al., 2004; Deno, Mirkin, & Marston, 1980). Thus, it can be inferred that as children increase the number of words read correctly, they are improving their ability to comprehend reading passages (O'Connor, White, & Swanson, 2007). Moreover, research suggests that CBM can be used to identify students with difficulties and influence instructional decisions throughout a child's educational career (Shinn, 1998).

Previous research on curriculum-based measures of writing at the elementary level indicated that the number of words written, the number of words spelled correctly, and the number of correct word sequences are technically adequate indicators of writing proficiency (Deno, Marston, & Mirkin, 1982; Deno et al., 1980; Shinn, 1998). More recently, the number of correct punctuation marks used in response to 3-minute story starters was found to have some promise as an indicator of writing proficiency for third- and fourth-grade students (Gansle, Noell, VanDerHeyden, Naquin, & Slider, 2002). However, many of these same indicators were not found to be appropriate measures of writing competency for students at the secondary level (Parker, Tindal, & Hasbrouck, 1991; Tindal & Parker, 1989; Watkinson & Lee, 1992; Weissenburger & Espin, 2005).

At the middle school level, research indicates that the number of correct word sequences (CWS) and the number of correct word sequences minus incorrect word sequences (CWS-ICWS) are better indicators of writing proficiency for these older students (Espin, Scierka, Skare, & Halverson, 1999; Espin et al., 2000; Espin & Tindal, 1998; Watkinson & Lee, 1992; Weissenburger & Espin, 2005). Moreover, investigations involving writing samples from middle school students indicate that longer samples (i.e., 7 minutes or longer) produce more technically adequate curriculum-based measures for this age group (Espin, De La Paz, Scierka, & Roelofs, 2005; McMaster & Espin, 2007).

Despite promising results from previous investigations into the technical adequacy of curriculum-based measures of writing for elementary and middle school students, research is sparse at the high school level. The following section reviews three published studies in which curriculum-based measures of writing were investigated for high school students.

Research on Curriculum-Based Measures of Writing at the High School Level

In an effort to ascertain the effectiveness of curriculum-based measures of writing in making special education screening decisions, Parker and colleagues (1991) investigated the writing samples from Grades 2, 5, 6, 8, and 11. The 6-minute writing samples from the 11th-grade students ($n = 63$) were scored for the number of words written, the number of words spelled correctly, the number of correct word sequences, the percentage of correctly spelled words, and the percentage of correct word sequences. Using holistic ratings as the criterion measure, the investigators found only a moderate correlation ($r = .48$) between the ratings and the number of correct word sequences for the 11th-grade students. The other curriculum-based measures yielded criterion-related correlation coefficients ranging from a low of .39 for the number of words written to a high of .46 for the percentage of correct word sequences.

In a later study examining the criterion-related validity of written expression curriculum-based measures at the secondary level, researchers (Espin et al., 1999) used the

writing samples from 147 randomly chosen students receiving instruction in different levels of 10th-grade English classes (i.e., Enriched English, Regular English, and Basic English). Students with learning disabilities were included in the participant sample. Correlations were computed between a variety of curriculum-based measures and four criterion measures. Criterion measures included the language arts subtest of the *California Achievement Test* (CAT), the group placement of the students, the students' semester grades in English, and holistic ratings of writing quality. Results indicated that the highest correlations were derived from comparing the criterion measures with the number of correct word sequences, the mean length of correct word sequences, the number of characters per word, and the number of sentences written. It is unfortunate that the strongest correlations between these curriculum-based measures and the criterion measures were low to moderate (i.e., .30 to .45), indicating that no single measure was sufficiently high to substantiate adequate criterion-related validity. Through regression analyses, however, it was determined that a combination of measures (characters per word, sentences written, and mean length of correct word sequences) more strongly predicted the CAT language arts score than any single measure (R = .62). Other findings revealed that four different curriculum-based measures could differentiate at least one student group from another. These measures included the number of correct word sequences, the mean length of correct word sequences, the characters per word, and the number of sentences written.

The third study involved an investigation of the reliability and validity of curriculum-based measures of writing for a multigrade sample of students (Weissenburger & Espin, 2005). Results from the 10th-grade students (n = 176) indicated that total words written, correct word sequences, and correct minus incorrect word sequences were insufficiently correlated with the 10th-grade language arts scores from a statewide assessment (i.e., the *Wisconsin Knowledge and Concepts Examination* [WKCE]). Criterion-related correlation coefficients ranged from .04 to .12 for total words written, from .18 to .26 for correct word sequences, and from .29 to .36 for correct minus incorrect word sequences for the 10th-grade sample. Furthermore, although acceptable alternate-form reliability coefficients were found for the 10-minute CWS and CWS-ICWS scores (r = .75 and .80), other results demonstrated that the 3-minute writing samples yielded insufficient reliability coefficients (i.e., r = .55 to .61) for the high school sample.

The above studies demonstrate that those curriculum-based measures of writing that worked well for elementary and middle school students have limited empirical support at the high school level. Because writing development and instruction occur throughout high school, there is a need to identify technically adequate curriculum-based measures for this population.

The purpose of this study, then, was to examine whether simple and efficient alternative measures of writing could be identified for use at the high school level. Specifically, the technical adequacy of four unique measures was examined. Given this charge, four research questions were addressed:

Research Question 1: Could reliable alternative curriculum-based measures of writing be identified for high school students?

Research Question 2: Do these alternative curriculum-based measures of writing correlate with holistic scores of writing proficiency for high school students?

Research Question 3: Do these alternative curriculum-based measures of writing proficiency correlate with the *Wisconsin Knowledge and Concepts Examination* results for high school students?

Research Question 4: Could these alternative curriculum-based measures of writing be used to accurately screen for learning disabilities or low performance on a statewide measure of language arts for high school students?

Method

This study involved a reanalysis of 10th-grade writing samples collected as part of an earlier study designed to analyze the technical adequacy of curriculum-based measures in written expression across grade levels (see Weissenburger & Espin, 2005). The purpose of this study was to determine whether technically adequate curriculum-based measures of writing could be found for high school students. To examine this topic, all 10th-grade writing samples from two school districts were rescored using four alternative curriculum-based measures.

Participants and Settings

The first participating school district (District #1) was a small, rural school district made up of students who resided in and around an unincorporated township. District #1 had a total student enrollment of 256 (pre-K through Grade 12). District #1's students were reported to be 1% Black, 1% Hispanic, and 98% White. Of the total district population, 39.1% of the students were eligible for free and reduced lunches. The average ACT score was 20.7 (national M = 21.0, SD = 4.7), and no students were exempt from taking the WKCE during the

Table 1
Sample Characteristics ($n = 82$)

Demographic	*n*	%
Gender		
Male	43	52.4
Female	39	47.6
School		
District #1	10	12.2
District #2	72	87.8
Ethnicity		
White/Caucasian	82	100
Other	0	0
Educational status		
Learning disabled	8	9.8
Speech/language disabled	0	0
Special education (other)	0	0
General education	74	90.2
Economic status		
Free/reduced lunch	14	17.1
No free/reduced lunch	68	82.9

Note: $N = 110$.

2000–2001 school year. The attendance rate was 92.36%, the graduation rate was 100%, and the per pupil expenditure was $8,537 that year.

The second school district (District #2) was a rural public school district serving residents of an incorporated farming community and surrounding rural area. District #2 had a pre-K–12 enrollment of 1,114. The ethnic breakdown of students was .3% American Indian, 1% Asian, .4% Black, 1.3% Hispanic, and 97% White. District #2 had 30.4% students who were eligible for free and reduced lunches. The average ACT score was 21.7, and less than 1% of the students were exempt from taking the WKCE during the 2000–2001 school year. The attendance rate was 94.29%, the graduation rate was 96.15%, and the per pupil expenditure was $7,693 that year.

A total of 108 10th-grade students from the two districts participated in the study. Of these students, 82 (75.9%) produced complete, readable data sets. The resulting participant sample included general education students ($n = 74$) and students with disabilities ($n = 8$). All students with disabilities were classified as learning disabled. In the sample with learning disabilities, 6 were male and 2 were female. One student with learning disabilities attended District #1, and the remaining 7 attended District #2. Although 14 (18.9%) of the 10th-grade general education students were eligible for subsidized lunches, none of the students with learning disabilities were identified as participants in their district's free or reduced lunch programs. Participant demographic data are presented in Table 1.

Data Collection

School district administrators were contacted in the fall, and permission was granted to administer the curriculum-based writing assessments to the entire population of 10th-grade students in both districts. Two data collection sessions were scheduled for each 10th-grade English class within a 7-day period during the months of January and February 2001. Students with disabilities were included in the data collection sessions.

The second author administered the curriculum-based writing assessments to the students. Each student produced two narrative writing samples, with only one sample generated per day. The narrative writing samples were written in response to two story starters (i.e., Form A: "I stepped into a time machine," and Form B: "It was a dark and stormy night"), and the story starters were counterbalanced to control for order effects. After receiving a story starter, students were given 30 seconds to think and 10 minutes to write.

At the end of each data collection session, the classroom teachers collected the writing samples and gave them to their districts' clerical staff. The clerical staff then made copies of the writing samples so the originals could be returned to the teachers for instructional purposes. To ensure anonymity, the districts' staff removed the student names and assigned numerical codes to the writing samples. The copied writing samples were then returned to the second author for scoring. The clerical staff also removed student names and assigned corresponding numerical codes to academic record information (i.e., gender, ethnicity, language status, eligibility for free or reduced lunch, special education status) to protect the identities of the students.

In June 2001, the WKCE results, published and scored by CTB/McGraw-Hill, were supplied to the second author. The results included the normal curve equivalent (NCE) scores for all subject areas (i.e., reading, language arts, science, social studies, and math). Once again, the districts' clerical staff removed all names from the WKCE results, and corresponding numerical codes were assigned to the data prior to their submission to the researcher.

Instrumentation

CBM Scores

Based on previous research and the need to identify efficient measures, four alternative measures were investigated in this study. These measures included the number of incorrect word sequences, the number of correct punctuation marks, the number of adverbs, and the

Table 2
Scored Paragraph Written by Student With Learning Disabilities

When they hit it the truck got ∨ lonched ∨ in the air and it landed **front first** ∨ ∨ the front hit the ground then the back did and then one of the girls hit her hand on the ∨ seling ∨ of the truck ∨ ∨ she put a big dent in it. ∨ then ∨ the ∨ tried to start the truck ∨ it wouldn't start. ∨ soo ∨ we walked for 5 miles to the ∨ nearist ∨ house and ∨ call ∨ his mom ∨ then they called the police.

ADJ = 3
ADV = 2
CPM = 4
ICWS = 19

Note: ∨ = incorrect word sequence (ICWS); underlining = adjective (ADJ); bold = adverb (ADV); CPM = correct punctuation marks.

number of adjectives. Although the number of adjectives and the number of adverbs have no obvious research support for their inclusion in this exploratory study, the investigators posited that the number of adjectives and adverbs would vary according to the maturity or quality of writing for high school students. With regard to the number of correct punctuation marks, a more recent study at the elementary level provided some foundation for the reliability and validity of this measure for younger students (Gansle et al., 2002). The number of incorrect word sequences was chosen because it was used as an essential element in a technically adequate combination measure in several prior studies (i.e., correct minus incorrect word sequences).

The number of incorrect word sequences (ICWS), the number of correct punctuation marks (CPM), the number of adjectives (ADJ), and the number of adverbs (ADV) were scored for each 10-minute sample (see Table 2 for a scored paragraph).

Two adjacent words were scored as an ICWS when one or both words in an adjacent two-word sequence were misspelled or were syntactically or grammatically unacceptable to a native speaker of the English language (Videen, Deno, & Marston, 1982). An ICWS also was scored when a student failed to capitalize a word at the beginning of a sentence or failed to use correct punctuation at the end of a sentence. ICWS scorers were instructed to ignore punctuation or capitalization errors in the middle of sentences unless a missing apostrophe created an incorrectly spelled word (e.g., *dont* for *don't*) or the student failed to capitalize a proper noun (e.g., *nintendo* for *Nintendo*). Furthermore, scorers were instructed to score for ICWS when students omitted words or constructed run-on sentences.

CPM was derived by counting the number of correct punctuation marks (based on their correct location and use) in a sentence (Gansle et al., 2004). A set of quotation marks (e.g., "He went to the store") was counted as two punctuation marks, and a comma was counted as correct if it was applied at a natural pause in the text even though some writers would not consider the comma's placement as mandatory.

ADJ was calculated by counting "recognizable adjectives" as described in Howell and Memering (1986, p. 6). Predicate adjectives (e.g., successful, bright, gleaming) and proper adjectives (e.g., Irish, Japanese, Shakespearian) were counted, but articles (e.g., a, an, the), demonstrative adjectives (e.g., this, that, these, those), and possessive adjectives (e.g., her, his, their) were not.

ADV was determined by counting the number of words that modified the verbs within the sentences. Adverbs often end in *ly* (e.g., quickly, nearly, slowly) and tell how (e.g., slowly, nearly, surely), where (e.g., everywhere, upstate, above), how much (e.g., lots, very, almost), when (e.g., Saturday, tomorrow), and to what extent (e.g., too, often, rarely).

CBM Scoring

The second author and six graduate students in the school psychology and school counseling programs at the University of Wisconsin–Stout scored the CBM writing samples for incorrect word sequences in 2001. The scorers were trained during two 1-hour training sessions, and the graduate students were hired if they achieved 90% or above agreement ratios with the second author on exemplar samples. Every 20th scored sample was submitted to the second author to prevent rater drift throughout the scoring period. Furthermore, scoring questions were addressed via e-mail throughout the scoring process, and the answers were forwarded to the other scorers to promote scoring consistency.

The third author, an experienced high school English teacher, scored unmarked copies of the 10-minute writing samples for correct punctuation marks, adverbs, and adjectives. A scoring rubric and examples were provided to the scorer to aid in scoring.

Criterion Measures

In 2001, the WKCE was a statewide assessment of achievement derived from the TerraNova Assessment Series (CTB/McGraw-Hill, 1996). The WKCE was administered to all 4th-, 8th-, and 10th-grade students that year. The TerraNova's Form A: Level 21/22 was administered to the 10th-grade students in Wisconsin. Reviewers have supported the technical characteristics, standardization data, item selection procedures, format, appearance, and instructions of the TerraNova assessments (Monsaas, 2001; Nitko, 2001). According to Monsaas, coefficient alpha reliabilities

are consistently in the .80s and .90s for all TerraNova subject tests, although little information was available in the publisher's manual (CTB/McGraw-Hill, 1997) with regard to the criterion-related validity of the TerraNova series.

The NCE scores on the language arts subtest of the WKCE were used as one criterion measure. In addition, the NCE scores from the WKCE reading, mathematics, science, and social studies tests were correlated with the curriculum-based measures in an attempt to establish divergent validity. The NCE scores ranged from 1 to 99 and coincided with student national percentile scores at the 1st, 50th, and 99th percentiles. The 10th-grade portion of the WKCE included selected-response (i.e., multiple-choice) items. The language arts items were integrated with the reading items and organized within themes. The items were separated into their respective categories (i.e., reading or language arts) for scoring and reporting purposes. According to the publisher, the language arts test assessed editing, proofing, verb tense, verb agreement, basic sentence formation, sentence combining, paragraph writing, writing conventions, sentence structure, and complex thinking skills (CTB/McGraw-Hill, 1997).

Researcher-designed holistic ratings also were used as a criterion measure. The fourth author, another experienced high school English teacher, applied the holistic ratings to the unscored copies of the 10-minute writing samples. The holistic rating scale was adapted from CTB/McGraw-Hill's *Writing Assessment Guide* (CTB Macmillan/McGraw-Hill, 1993), and potential scores ranged from 1 (*poor*) to 6 (*exceptional*) for the individual samples.

Data Analyses

The first research question addressed the reliability of ICWS, CPM, ADJ, and ADV as indicators of writing proficiency for students in the 10th grade. To examine the reliability of these measures, alternate-form bivariate Pearson product-moment correlation coefficients were calculated through correlating the CBM scores from each of the two story-starter samples. Due to the sample size and number of comparisons, a conservative p value of .001 was used to determine if the correlations were statistically significant.

The second research question addressed the relations between the mean CBM scores from the two writing samples and the researcher-designed and teacher-applied holistic mean scores. The mean holistic scores ranged from 2.5 to 5.5, with scores of 2.5 ($n = 2$), 3.0 ($n = 13$), 3.5 ($n = 12$), 4.0 ($n = 26$), 4.5 ($n = 18$), 5.0 ($n = 9$), and 5.5 ($n = 2$). Bivariate Pearson product-moment correlation coefficients were computed between the mean CBM scores and the mean holistic scores. A conservative p value of .001 was adopted to determine statistical significance for the criterion-related validity coefficients.

The third research question addressed the relations between the mean CBM scores from the two writing samples and the statewide assessment scores. Bivariate Pearson product-moment correlation coefficients were calculated between the mean CBM scores and the WKCE standard scores. As in Research Question 2, a conservative p value of .001 was implemented to determine statistical significance for the criterion-related validity coefficients.

The last research question considered whether any of the mean CBM cut scores could be used to predict poor performance on the statewide exam or the presence of a learning disability. In a set of analyses, CBM cut scores at the 10th, 15th, 20th, 25th, and 30th percentiles were chosen to determine whether any of the measures could accurately identify low-performing students on the statewide assessment (i.e., the WKCE language arts test) or those students who received special education services based on a learning disability. Cross-tabulation analyses were used to identify which CBM percentiles were most sensitive (i.e., those that produced high true-positive rates and low false-positive rates).

Results

Preliminary Analyses

Means and standard deviations for the CBM scores are presented in Table 3. The CBM scores represent mean values from the two writing samples.

Mean comparisons between the general education sample and the sample with learning disabilities indicate that only two curriculum-based measures produced significant group effects: CPM and ICWS. As expected, the general education sample produced significantly more correct punctuation marks than those written by students with learning disabilities, $t(80) = -3.39$, $p \leq .001$. In contrast, students with learning disabilities generated more incorrect word sequences than those in general education, $t(80) = 6.50$, $p \leq .001$.

Alternate-Form Reliability

The first research question addressed the alternate-form reliability of ICWS, CPM, ADJ, and ADV as indicators of writing proficiency for students in the 10th grade. Means, standard deviations, and the alternate-form correlations for each curriculum-based measure are presented in Table 4. Alternate-form correlation coefficients ranged from .16 to

Table 3
Mean Curriculum-Based Measurement Statistics

Measure	*M*	*SD*	Skewness	Kurtosis
ADJ				
Total (*n* = 82)	7.84	3.24	1.16	1.46
LD (*n* = 8)	6.75	2.64	1.08	1.21
Non-LD (*n* = 74)	7.95	3.30	1.14	1.40
ADV				
Total (*n* = 82)	0.62	0.71	1.39	2.42
LD (*n* = 8)	0.25	0.38	1.32	0.88
Non-LD (*n* = 74)	0.66	0.73	1.31	2.13
CPM				
Total (*n* = 82)	17.38	8.93	0.50	0.82
LD (*n* = 8)	7.81	4.89	0.33	0.63
Non-LD (*n* = 74)	18.42	8.66	0.49	1.07
ICWS				
Total (*n* = 82)	21.93	17.59	1.92	4.83
LD (*n* = 8)	53.19	23.83	1.05	1.38
Non-LD (*n* = 74)	18.55	13.05	1.66	3.94

Note: ADJ = number of adjectives; ADV = number of adverbs; CPM = number of correct punctuation marks; ICWS = number of incorrect word sequences; LD = learning disabled.

Table 4
Curriculum-Based Measurement Means, Standard Deviations, and Alternate-Form Correlations

Measure	*M*	*SD*	*r*
ADJ			.14
Form A	8.68	4.50	
Form B	6.99	4.10	
ADV			.17
Form A	0.44	0.76	
Form B	0.80	1.08	
CPM			.76**
Form A	16.88	9.00	
Form B	17.89	10.05	
ICWS			.75**
Form A	21.96	20.08	
Form B	21.66	17.46	

Note: *n* = 82.
**$p < .001$.

.76, with ICWS and CPM producing significant correlations at the $p < .001$ level. CPM generated the largest alternate-form correlation coefficient of .76. This correlation coefficient was followed closely by ICWS ($r = .75$). Correlations for ADJ and ADV were not statistically or meaningfully significant ($r = .14$ and .17, respectively).

Correlations With Holistic Scores

The second research question addressed the relations between the mean CBM scores from the two writing samples and the teacher-applied holistic scores. Criterion-related validity coefficients between the CBM scores and the holistic scores are presented in Table 5.

Table 5
Curriculum-Based Measurement Correlations With the WKCE Subject Area Tests and Holistic Scores (*n* = 82)

Measure	WKCE Math	WKCE Science	WKCE SS	WKCE Reading	WKCE LA	Holistic Rating
ADJ	.12	.16	.07	.25*	.19	.18
ADV	.13	.01	–.02	.01	.01	.21
CPM	.18	.09	.00	.23*	.28*	.62**
ICWS	–.45**	–.24*	–.24*	–.46**	–.51**	–.71**

Note: ADJ = number of adjectives; ADV = number of adverbs; CPM = number of correct punctuation marks; ICWS = number of incorrect word sequences; WKCE = *Wisconsin Knowledge and Concepts Examination*; SS = social studies; LA = language arts.
*$p < .05$. **$p < .001$.

As indicated in Table 5, both CPM and ICWS were moderately to strongly related to the holistic scores ($r = .62$ and –.71, respectively). However, when correlated with the holistic scores, both ADJ and ADV produced very weak and insignificant correlations ($r = .18$ and .21, respectively).

Correlations With WKCE Language Arts NCE Scores

The third research question addressed the relations between the mean CBM scores from the two writing samples and the WKCE subtest NCE scores. Correlations between the CBM scores and the WKCE subtest NCE scores are presented in Table 5.

Results reveal that ICWS was moderately and inversely correlated ($r = –.51$) with the norm-referenced scores from the WKCE language arts subtest. CPM was weakly correlated with the WKCE language arts subtest scores ($r = .28$). Once again, ADJ and ADV produced very weak and insignificant criterion-related correlations with the WKCE language arts NCE scores ($r = .19$ and .01, respectively). It is interesting that the correlations between ICWS and the WKCE math and reading tests also were statistically significant (i.e., –.45 and –.46, respectively).

Predictive Validity of Cut Scores

The predictive accuracy was investigated for the two curriculum-based measures that demonstrated promise based on their reliability and validity correlation coefficients: ICWS and CPM. Results are presented in Table 6.

Table 6
Cut Score Accuracy for Purposes of Prediction

Predictor	Cut Score	LD	Non-LD	WKCE LA (< NCE of 50)	WKCE LA (≥ NCE of 50)
ICWS[a]	≥ 46.55	5/8	3/74	5/16	3/66
ICWS[b]	≥ 33.78	7/8	5/74	8/16	4/66
ICWS[c]	≥ 29.50	7/8	9/74	9/16	7/66
ICWS[d]	≥ 26.63	7/8	13/74	11/16	9/66
ICWS[e]	≥ 26.00	7/8	18/74	13/16	12/66
CPM[a]	≤ 7.00	4/8	7/74	6/16	5/66
CPM[b]	≤ 8.50	6/8	10/74	8/16	8/66
CPM[c]	≤ 8.80	6/8	10/74	8/16	8/66
CPM[d]	≤ 11.25	6/8	14/74	8/16	12/66
CPM[e]	≤ 12.50	7/8	21/74	11/16	17/66

Note: LD = learning disabled; WKCE = *Wisconsin Knowledge and Concepts Examination*; LA = language arts; NCE = normal curve equivalent; ICWS = number of incorrect word sequences; CPM = number of correct punctuation marks.
a. Cut score derived from the 10th percentile score on mean curriculum-based measure.
b. Cut score derived from the 15th percentile score on mean curriculum-based measure.
c. Cut score derived from the 20th percentile score on mean curriculum-based measure.
d. Cut score derived from the 25th percentile score on mean curriculum-based measure.
e. Cut score derived from the 30th percentile score on mean curriculum-based measure.

Findings indicate that a 20th percentile cutoff score for ICWS (i.e., ≥ 29.5) accurately identified 7 of the 8 students (87.5%) diagnosed with learning disabilities and 9 of the 16 students (56%) who scored below a NCE score of 50 on the WKCE. For CPM, a 20th percentile cutoff score (i.e., ≤ 8.8) accurately identified 6 of the 8 students (75%) with learning disabilities and 8 of the 16 students (50%) who scored below average on the WKCE.

Results in Table 6 reveal that using an ICWS cut score at the 20th percentile also misidentified 9 students (12%) as having a learning disability and 7 students (10.6%) who scored above average on the WKCE. Furthermore, a 20th percentile CPM cut score incorrectly identified 10 students (13.5%) as having a learning disability and 8 students (12%) who scored at or above average on the WKCE.

Discussion

Despite previous challenges in identifying technically adequate curriculum-based measures of writing for high school students, results reveal that the alternate-form reliability and criterion-related validity were supported for ICWS. CPM also demonstrated strong alternate-form reliability; however, this curriculum-based measure produced a statistically significant and meaningful criterion-related validity correlation coefficient with only one criterion measure (i.e., holistic ratings). The alternate-form reliability and the criterion-related validity evidence were insufficient for ADV and ADJ, and the utility of cut scores for predictive purposes was supported for ICWS and CPM. These findings and their related implications are addressed in the following sections.

Alternate-Form Reliability

In accordance with an earlier study examining the alternate-form reliability of ADJ at the elementary level (Gansle et al., 2002), the alternate-form bivariate Pearson product-moment correlation coefficients were unacceptably low for two of the CBM scoring indices: ADJ and ADV. The low alternate-form reliability coefficients for ADJ and ADV were likely due to the small number of adjectives and adverbs used by the 10th-grade students. The limited use of adjectives and adverbs by the high school students was disappointing, as it was expected that the 10th-grade students would use more descriptors due to their advanced writing competency. However, the 10th-grade students' restricted use of adverbs and adjectives may reflect higher levels of writing maturity. Our high school students may have preferred to apply more precise nouns and verbs (e.g., "I saw a Corvette" versus "I saw a fast car" or "he strolled through the woods" versus "he walked slowly through the woods") over adverbs and adjectives.

The strongest and most consistently reliable coefficients were found for ICWS and CPM. The alternate-form reliability coefficients for these measures are within the range Marston (1989) found for curriculum-based measures at the elementary level (r = .42 to r = .96), suggesting that these two 10-minute measures can be used to reliably assess the writing skills of high school students.

The strong alternate-form reliability coefficients for CPM and ICWS are encouraging due to the administration interval between the two writing samples. Although the two forms were counterbalanced to control for order effects, the two administrations did not occur within 1 day. The administration of some writing prompts was separated by as much as 1 week. Thus, the alternate-form reliability coefficients also reflected the stability of the scores from the first to the second administration. Tindal and Marston (1990) referred to this type of reliability as parallel form and test–retest, stating that this "form of reliability is rarely used, in part because it is so stringent, and adequate levels are difficult to achieve" (p. 104).

The alternate-form reliability coefficients for ICWS are especially noteworthy given the use of multiple scorers to score the 164 single writing samples. Although the same scorer scored some matched-pair samples, no attempt was made to control for the effect of interscorer variance. Thus, time, form, and interscorer effects likely influenced the alternate-form correlation coefficients for ICWS.

Criterion-Related Validity of Curriculum-Based Measures: Holistic Scores

The criterion-related validity of the curriculum-based measures was first examined by correlating the CBM scores with the holistic scores. Correlations between the holistic rating of students' writing and our potential indicators ranged from extremely low to moderately strong. ICWS produced a negative and moderately strong correlation coefficient ($r = –.71$), indicating that the number of ICWS was lower for more skilled writers. Because the ICWS score was influenced by errors in spelling, sentence structure, capitalization, punctuation, syntax, and grammar, samples containing greater numbers of ICWS likely hindered the rater's overall perception of writing quality. It is noteworthy to mention that no published studies to date have examined the use of ICWS in isolation as a potential indicator of writing proficiency at the secondary level (i.e., without first subtracting ICWS from the number of CWS).

The correlation between CPM and the holistic scores also was moderately strong ($r = .62$, $p \leq .001$). A significant finding for the criterion-related validity of CPM, although not as meaningful ($r = .37$, $p \leq .001$), was also found by Gansle et al. (2002), in which CPM, as an indicator of writing proficiency, was correlated with teacher rankings of students' writing skills at the elementary level. In addition to the use of a different criterion measure, our 10th-grade CPM correlation coefficient might be more robust than that found by Gansle and colleagues due to our longer writing sample (i.e., 10 minutes vs. 3 minutes), allowing for a greater range of CPM scores.

Another plausible explanation for the stronger high school criterion-related correlation coefficients for CPM is the relative syntactical complexity of high school students' writing samples. In previous research, syntactical complexity was measured through such metrics as the average length of T-units (i.e., units that can stand alone as sentences) and number of subordinate clauses (e.g., . . . , which originally came from China, . . .) in writing samples (Noyce & Christie, 1985; Scott & Windsor, 2000; Silliman, Jimerson, & Wilkinson, 2000). If subordinate clauses are more commonly used by older, more proficient students, it is reasonable to infer that the high school students' writing samples would include more punctuation marks (i.e., commas). Further research should examine the extent to which CPM may be purely a measure of mechanics or a global outcome measure of syntactical maturity and whether differences in this measure are based on the age and writing competence of the students.

It is disappointing that no meaningful or significant correlations were found for ADJ and ADV with the holistic scores. As with the alternate-form reliability coefficients, the limited use of adverbs and adjectives by the 10th-grade students likely limited the criterion-related validity correlation coefficients for ADJ and ADV. These results suggest that educators should not use ADJ or ADV from time-limited samples for predictive purposes.

Criterion-Related Validity: WKCE Language Arts NCE Scores

The strength of relations between the curriculum-based measures and WKCE scores indicate that one curriculum-based measure, ICWS, was negatively and moderately correlated with the multiple-choice language arts statewide assessment. CPM and the statewide assessment scores yielded a lower correlation, and as was true with the relations between these curriculum-based measures and the holistic scores, no meaningful or significant correlations were found for ADJ and ADV.

One possible explanation for the lower correlation coefficients between all curriculum-based measures and the WKCE scores was the use of the WKCE language arts subtest as a criterion measure. Many previous criterion-related validity studies involving the use of curriculum-based measures of writing (Deno et al., 1980; Espin et al., 2000; Parker et al., 1991; Tindal & Parker, 1989) used direct or constructed-response criterion measures (e.g., *Test of Written Language* and holistic ratings). The 10th-grade 2000–2001 WKCE language arts test was not a direct measure of writing competency as it was solely made up of selected-response or multiple-choice items. Therefore, whereas CPM and ICWS and the WKCE language arts subtest were all developed to assess a student's general writing proficiency, the two curriculum-based measures and the WKCE language arts subtest likely measure different facets of written expression. This inference is supported by the higher correlations between ICWS and the holistic scores as well as the higher correlations between CPM and the holistic scores. Furthermore, lower correlations between the curriculum-based measures of written expression and other indirect measures (i.e., the *California Achievement Test* and the

Stanford Achievement Test) of writing competency were found in several previous studies (i.e., Espin et al., 1999; Marston, 1982; Tindal & Parker, 1991).

The significant correlations between ICWS and the non-language arts WKCE scores (i.e., reading and math) warrant further discussion. First, it could be argued that reading and language arts tests sample similar domains. However, the significant correlation between ICWS and the WKCE math NCE score was surprising. The significant correlations between ICWS and three WKCE tests (i.e., math, language arts, and reading) imply that ICWS might have potential for screening purposes in other domain areas.

Predictive Accuracy: Using ICWS and CPM Cut Scores

This study provides evidence that educators may be able to use ICWS or CPM to screen students for learning disabilities at the high school level. Twentieth percentile cut scores for ICWS (scores equal to or greater than 29.5 incorrect word sequences) in a 10-minute sample correctly identified nearly all students classified as learning disabled. Furthermore, percentile cut scores for CPM (scores equal to or less than 8.8 correct punctuation marks) in a 10-minute sample correctly identified most students classified as learning disabled in this study's sample.

Other findings suggest that school personnel may be able to use ICWS and CPM to screen for poor performance on a statewide measure of language arts. Eighty-one percent of students who produced 26 or more incorrect word sequences in a 10-minute sample also scored lower than a NCE score of 50 on the WKCE language arts test, and 68% of students who produced 12.5 or fewer correct punctuation marks in a 10-minute sample scored lower than average on the statewide language arts assessment.

Because universal screening procedures are now recommended to identify at-risk students in need of empirically validated instruction or further evaluation, this exploratory study provides preliminary evidence that relatively inexpensive and group-administered curriculum-based measures of writing (i.e., ICWS and CPM) have potential utility for screening purposes in high school settings.

Limitations

Given this research was conducted in western Wisconsin, one limitation is the homogeneous participant sample. All participants were categorized as White or Caucasian and from rural settings. As a result, these findings may not be pertinent to urban or more culturally diverse populations.

Another limitation may be the selection of the criterion measures. As the 10th-grade WKCE language arts test contained only selected-response or multiple-choice items, critics may argue that the WKCE language arts scores were not indicative of the students' general writing proficiency. Furthermore, caution should be applied when considering the correlations between the curriculum-based measures and the holistic ratings. These correlations were based on scores derived from the same writing samples. Although the CBM scores and the holistic scores were applied to unmarked writing samples by different scorers and raters, the scores were not fully independent due to the use of the same samples. Correlating the CBM scores with holistic scores derived from other writing products would be preferable to the approach used in this study.

Finally, it is important to note that the findings of this study may only apply to 10th-grade students. Without confirmative research in other grades, these results may not be applicable to all grades at the high school level. Further research should be conducted to provide evidence of the technical adequacy of written expression curriculum-based measures for general education and special education high school students in each grade.

Implications for Practice

Several important implications can be derived from this study. First, ICWS shows promise as a technically adequate indicator of writing proficiency at the high school level. As such, evidence suggests that ICWS may be used for screening or predictive purposes for high school students. Second, CPM also yielded encouraging results; however, this curriculum-based measure produced a statistically significant result with only one of the two criterion measures. Thus, more information on CPM is needed before educators can use this measure with assurance for high school students. Furthermore, ADJ and ADV did not prove to be technically adequate assessments of writing proficiency for 10th-grade students. Given these results, teachers and other educators should not use ADJ or ADV for predictive or screening purposes.

For students with learning disabilities, our results and the results of others (Graham & Harris, 2002; Graham et al., 2001; Harris & Graham, 1999; Lienemann et al., 2006) indicate that these students use fewer punctuation marks and make more spelling, syntactical, and grammatical errors than their general education peers. As such, special educators should consider using a balanced approach to writing instruction that incorporates explicit skill instruction in the use of conventions along with

instructional techniques designed to improve meaning, process, and form for individual learners (Graham et al., 2001).

Implications for Research

Despite our encouraging results, further research is needed to investigate the use of ICWS and CPM as indicators of writing proficiency at the secondary level and for students with disabilities. Because monitoring the progress of students is a primary purpose of CBM, further study is needed to examine whether these curriculum-based measures can be used to monitor a student's growth in writing proficiency over time.

The validation of any measure is a cumulative process. Further technical adequacy studies should be conducted with different populations to determine whether these findings can be generalized across various disability groups, different cultures, and different proficiency levels.

Summary

This study revealed moderately strong alternate-form reliability coefficients and variable criterion-related validity coefficients for CPM. ICWS yielded the most substantive results, as this measure produced a moderately strong alternate-form coefficient and sufficient criterion-related validity coefficients with both criterion measures. Furthermore, results suggest that using 20th percentile ICWS or CPM cut scores may assist educators in screening high school students for learning disabilities or to identify those at risk of performing below average on statewide testing programs. Thus, although replication is necessary, our results indicate that both ICWS and CPM show promise as curriculum-based measures of writing proficiency at the high school level.

Screening for writing difficulties, monitoring the writing progress of students with writing problems, and providing effective writing instruction for students at the high school level call for resolute and collaborative efforts by special and general educators. This study, however, provides preliminary evidence that group-administered and relatively inexpensive curriculum-based measures of writing may help identify writing difficulties that warrant further investigation and intervention at the high school level.

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