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Assessment and instruction of oral reading fluency among adults with low literacy

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Abstract

We statistically examined 295 low-literacy adults' oral reading fluency measured by total word and word error rates with connected prose. Based on four fluency ability groupings in relation to standardized assessments of reading-related skills (e.g., phonemic awareness, word recognition, vocabulary, comprehension, and general ability) the results suggest that adults that read at comparable correct word rates vary significantly in the number of total words and word errors. These differences were independent of assessed general ability level. Total word and word error rates, thus, offer a picture of learner reading ability that can help instructors emphasize instruction in deficit reading components.

Key Words: adult education, adult literacy, oral reading fluency, assessment

Ninety-three million or 43% of American adults read at or below a basic level, and one-third of these individuals lack even the most simple, concrete literacy skills (Kutner, Greenberg, & Baer, 2006). Why, after decades of educational research and advancements in instructional practices, do so many adults lack literacy proficiency? Limited understanding of adults' reading abilities and specific instructional models account for some of the difficulties (Kruidenier, 2002; National Center for Family Literacy, 2005; National Institute of Child Health and Human Development [NICHD], 2000). However, instructional neglect of fluency is also implicated in the problem (Allington, 1983; Fuchs, Fuchs, Hosp, Jenkins, 2001; NICHD, 2000; Rasinski, 2006). Therefore, we explored how we might better understand adult oral reading fluency (ORF) and its implications for adult literacy assessment and instructional planning.

Fluency is commonly defined as the ability to read text with speed, accuracy, and proper expression (NICHD, 2000). Because most readers spend far more time in silent reading, ORF historically has received less attention in the classroom than other components of reading, such as decoding, vocabulary, and comprehension skills and strategies (Allington, 1983; Fuchs, et al., 2001; Pikulski & Chard, 2005; Rasinski & Zutell, 1996). The importance of developing ORF is found not in itself, but as an indicator of silent reading fluency and in its significant correlation with reading comprehension or competence (Calfee & Piontkowski, 1981; Fuchs, et al., 2001; Herman, 1985; Pinnell, Pikulski, Wixson, Campbell, Gough, & Beatty, 1995; Stanovich, 1986). Harris and Hodges (1995) expanded the definition of fluency to "freedom from word identification problems that might hinder comprehension" (p. 85). Similarly, Wolf and Katzir-Cohen (2001) described fluent readers as those who demonstrate "a level of accuracy and rate where decoding is relatively effortless; where oral reading is smooth and accurate with correct prosody; and where attention can be allocated to comprehension" (p. 218).

Harris and Sipay (1990) described two types of readers that lack fluency: the print-bound reader and the context reader. Print-bound readers read slowly, tend to pause after every word and ignore or misinterpret punctuation. As word-by-word readers, they may demonstrate accuracy when reading word lists, yet their slow pace can diminish understanding and recall of connected words in sentences or paragraphs (Sundbye, 2001). The limited capacity theory of reading (Lesgold & Perfetti, 1978; Perfetti, 1985) suggests such inefficient word recognition processes "drain cognitive resources...needed for integrating and constructing meaning from text" (Jenkins, Fuchs, van den Broek, Espin, Deno, 2003, p. 237), thus contributing to a lack of fluency and poor reading comprehension.

Context readers (Harris & Sipay, 1990) tend to read with speed and prosody, but with inaccurate word recognition, skipping, adding, or substituting words, and sometimes even invent a new story that bears little resemblance to the text. They often score better on measures of silent reading than on oral reading, particularly when tasked with finding general meaning as opposed to recalling details. Pinnell (2002) found that if word errors did not change the meaning, comprehension was maintained; however, as errors accumulated, meaning was lost. Other researchers have found that word recognition ability accounts for nearly all the reliable variance in reading ability (e.g., Hoover & Gough, 1990; Vadasy, Sanders, & Peyton, 2005).

Based on these views, we speculate that readers may be best described using just a few simple indicators of reading abilities and that such descriptions would better characterize the learner and point to instructional frameworks that may improve their reading.

Assessing Fluency

Fuchs et al. (2001) found only 8% of the standardized reading assessments extant during the last century assessed ORF. From the 1970's through the 1990's, less than 4% of the standardized reading assessments that became available included a measure of ORF. In recent years, curriculum based measures (CBM) of ORF have become prevalent in schools. CMBs typically use a single metric, a correct words rate (e.g., DIBELS; Good & Kaminski, 2002; Hasbrouck & Tindal, 1992). Research generally supports the notion of distinguishing between high- and low-proficiency readers on the basis of this metric as better than in-context word recognition errors (e.g., Fredriksen, 1981; Fuchs, et al., 2001).

Systems of informal assessment of ORF (e.g., informal reading inventories, miscue analyses, pausing indices, running records, reading speed calculations) address an instructor's need for more useful information for making instructional decisions. Such assessments typically measure correct words rate, word errors (e.g., mispronunciation, substitution, omission), and prosody errors (e.g., omitting or adding punctuation, repeating words). Informal assessments can provide an instructor a high degree of instructional direction for an individual learner, yet they require a high level of examiner time and diagnostic activity. Furthermore, informal assessments do not compare individual readers with normative levels for age and grade levels to evaluate reading proficiency.

These varied assessments suggest that assessing fluency with correct words rate alone may be too limiting for instructional planning. Alternatively, by simply adding word error rate to the picture, we suggest that instructors may be able to more efficiently and effectively plan instruction for low-literacy adult learners.

Instruction in Fluency

Instructional methods for improving a developing or struggling reader's fluency typically consist of an increased volume of reading practice, such as repeated readings of the same text, silent independent reading of a wide array of texts, and neurological impress methods (Flood, Lapp, & Fisher, 2005; NICHD, 2000; Samuels, 2006). Although little research exists to validate them, numerous variations of repeated readings (e.g., classic repeated reading, partner reading, guided reading, Readers' Theater, Radio Reading, choral reading) have been used in classrooms for many years with some success (Samuels).

Not every reader will improve ORF through an increased volume of reading, whether with repeated texts or a wide array of texts. Pikulski's (2006) approach to fluency emphasizes that developing readers must acquire underlying alphabetic skills before increased reading volume will increase ORF. Samuels and Wu (2003) found the benefits of increased independent reading depended on prior reading ability. Their study showed among lower-ability students, those who spent more time independently reading did not necessarily make greater gains in

reading achievement than those who did not; among higher-ability students, those who spent more time independently reading produced greater gains in reading achievement than those who did not. In the case of developing or low-ability readers, instruction in phonetic decoding skills, vocabulary, and high-frequency sight word recognition may be more helpful for developing fluency. A balanced or integrated approach to instruction that addresses a mixture of word-level skills, processing speed, and comprehension may produce the greatest ORF (e.g., Pressley, Gaskins, & Fingeret, 2006; Samuels, 2006).

Fluency in Adults with Low Literacy

Most reading fluency research has been conducted with young readers, not low-literacy adults who differ from children in several ways. As children learn to read, they naturally increase in cognitive processing speeds for developmental reasons; in contrast, adults' cognitive processing speeds reach a plateau between 18 and 35 years of age (Kail & Salthouse, 1994). Thus, the strong connection between reading speed and improved reading ability or comprehension observed in children may be an over simplification when assessing and instructing adults with low literacy. In fact, Sabatini's (2002) study of low-literacy adults identified a significant connection between word recognition ability and speed of processing. Further, adults have life experiences children do not, which generally include helpful prior knowledge and vocabulary that may aid word recognition and reading comprehension. However, adults with low literacy also may have years of experience habitually using inappropriate, awkward or obstructive reading behaviors; practicing more of the same would likely not be helpful.

Perspectives on Adult Fluency

Because adults with low literacy cognitively and experientially differ from children, we sought to better understand their ORF and its implications for assessment, instruction, and evaluation. Specifically we asked, Can oral reading total word rates and word error rates together provide an understanding of low-literacy adults' instructional needs? To explore the answer to this question we examined subgroups based on total word and word error rates.

Some researchers suggest that the value of subgroup analysis rests with the instructional implications. Aaron's (2006) found significant results when differentiating remedial instruction for children in three subgroups based on a component model of reading. Catts, Hogan and Adlof (2005) recommended instructional remediation for emerging and developing reader subgroups formed on the basis of word recognition and linguistic comprehension measures. Likewise, Strucker and Davidson (2003) identified eleven adult reading profiles based on five reading components, and recommended using the profiles to drive instructional decisions. Therefore, we present an analysis of 295 low-literacy adults' ORF in relation to multiple standardized measures of reading and reading-related abilities, and discuss instructional implications for four groups formed on the basis of total word and word error rates.

Method

For our exploratory study, we measured word errors in relation to reading speed with connected prose at a fixed level of difficulty, that is, word errors per minute (wepm) in relation to total words per minute (twpm). We chose to use total word rate rather than correct word rate, which is the typical measure of ORF, because in our analysis correct words are not independent of word errors ($r_{xy} = .99$). We chose a rate-based measure of word errors because an accuracy percentage has a record ceiling constraint (i.e., 100%; White & Haring, 1976), and so could limit our investigation. Moreover, "rate measures function better than accuracy in detecting reading difficulties" (Jenkins, et al., 2003, p. 244).

We formed four groups based on twpm and wepm and statistically examined each group's relationship to outcomes from a standardized test battery of reading-related abilities and skills, such as phonemic awareness, word recognition, vocabulary, comprehension, and intellectual ability. Finally, we performed multivariate statistical comparisons of the four groups, controlling for variables that contribute to the differences in twpm and wepm.

Setting and Sample

We collected data from individuals enrolled in thirteen Midwestern Adult Education and Family Literacy Act (AEFLA; P.L. 105-220) programs during a 30-month period beginning spring 2003. Participants had to be at least 16 years old, be withdrawn from secondary education, and have U.S. citizenship or authorization to work in the U.S. as a foreign national in order to receive a participation payment. Because this study addressed literacy and not language differences, we excluded learners enrolled in English as a Second Language (ESL) courses.

Our research design called for a stratified sample with representation from each of the National Reporting System's (NRS; U.S. Department of Education [USDE], 2004) six educational functional levels—Adult Basic Education Beginning Literacy at Level 1 through High Adult Secondary Education at Level 6. We determined learners' NRS levels based on their Comprehensive Adult Student Assessment System (CASAS, 2001) reading diagnostic scores. For Levels 4, 5, and 6 we randomly selected from among the volunteers at each study site for a total of approximately 60 learners per level. Because of few Levels 1, 2, and 3 volunteers, we did not randomize, but included all available learners at these levels.

We selected a total of 330 learners, 11 of whom subsequently declined to participate, most commonly due to "lack of time." We eliminated 11 participants' data because of incomplete information and 13 more because of validity concerns (e.g., statistical outliers, cognitive disability such as traumatic brain injury). The remaining 295 learners were classified as follows: Level 1 = 25, Level 2 = 46, Level 3 = 56, Level 4 = 57, Level 5 = 55, and Level 6 = 56.

Sample description. Table 1 describes the sample by gender, age, and race/ethnicity. Typical of AE learners, the sample was 60% female and ranged in age from 16 to 73 years, with a median age of 24 years. Race/ethnicity was representative of the study region's non-ESL, AE

participants with 37% White Non-Hispanic, 35% African American, 11% White Hispanic, 17% Other or not reported.

Table 1
Sample Distribution by Age Group, Race/Ethnicity, and Gender

	16-18 years		19-24 years		25-44 years		45-59 years		Over 59 years		Total	
White Non-Hispanic												
Female (% of *N*)	13	(4%)	19	(6%)	27	(9%)	7	(2%)	1	(0%)	67	(23%)
Male (% of *N*)	11	(4%)	12	(4%)	10	(3%)	7	(2%)	2	(1%)	42	(14%)
African American												
Female (% of *N*)	7	(2%)	23	(8%)	13	(4%)	9	(3%)	6	(2%)	58	(20%)
Male (% of *N*)	8	(3%)	13	(4%)	6	(2%)	15	(5%)	3	(1%)	45	(15.%)
White Hispanic												
Female (% of *N*)	3	(1%)	10	(3%)	5	(2%)	2	(1%)	1	(0%)	21	(7%)
Male (% of *N*)	2	(1%)	5	(2%)	4	(1%)	0	(0%)	0	(0%)	11	(4%)
Other/Not reported												
Female (% of *N*)	3	(1%)	8	(3%)	14	(5%)	4	(1%)	2	(1%)	31	(11%)
Male (% of *N*)	5	(2%)	6	(2%)	5	(2%)	4	(1%)	0	(0%)	20	(7%)
Total												
Female (% of *N*)	26	(9%)	60	(20%)	59	(20%)	22	(8%)	10	(3%)	177	(60%)
Male (% of *N*)	26	(9%)	36	(12%)	25	(9%)	26	(9%)	5	(2%)	118	(40%)
Total (% of *N*)	52	(18%)	96	(33%)	84	(29%)	48	(16%)	15	(5%)	295	(100%)

Table 2 presents standard scores for intellectual and reading ability by NRS level and in total. The mean Wechsler Adult Intelligence Scale III (WAIS; Wechsler, 1997) pro-rated IQ score was 81.6 (*SD* = 12.5). Further illustrating the low literacy of the sample are mean standard scores from: Woodcock Reading Mastery Tests-Revised (WRMT-R; Woodcock, 1998) subtests: Word Attack 70.8 (*SD* = 20.3; grade equivalent [GE] = 3.8), Word Identification 77.8 (*SD* = 19.2; GE = 4.8), and Passage Comprehension 72.3 (*SD* = 22.8; GE = 4.7).

Table 2
Mean and Standard Deviation Word Attack, Word Identification, Passage Comprehension and IQ Standard Scores by NRS Level

		Mean standard score (Standard deviation)			
	N			WRMT-R	
		WRMT-R	WRMT-R	Passage	WAIS
NRS level		Word Attack	Word Identification	Comprehension	pro-rated IQ
Level 1	25	45.7 (14.7)	38.3 (12.0)	35.0 (15.7)	72.2 (9.7)
Level 2	46	64.7 (15.8)	52.5 (17.6)	52.6 (18.8)	72.2 (6.6)
Level 3	56	74.5 (15.4)	67.0 (15.9)	66.5 (17.6)	78.1 (11.1)
Level 4	57	81.1 (13.4)	73.9 (11.6)	78.3 (11.9)	80.8 (8.5)
Level 5	55	88.7 (12.2)	82.2 (10.4)	81.4 (15.1)	85.3 (10.2)
Level 6	56	92.1 (11.6)	90.7 (7.5)	95.2 (8.7)	94.7 (12.1)
Total	295	70.8 (20.3)	77.8 (19.2)	72.3 (22.8)	81.6 (12.5)

Assessment Instruments

Independent variables. To measure our independent variables, twpm and wepm, we used two sixth grade passages and the error scoring criteria (Figure 1) from the Qualitative Reading Index (QRI; Leslie & Caldwell, 2001).

Figure 1
Qualitative Reading Inventory (QRI) Error Scoring Criteria

Additions	if reader adds words to the passage or adds a letter to the end of a word, count as an error
Omissions	if reader omits entire word, count as an error
Self-corrections	if reader says word wrong and then corrects him or herself, count one error and one correct
Repetitions	if reader says word correctly then rereads correctly, count only the first reading as correct and each repetition of the word as an error
Mispronunciations	if reader mispronounces a word, count as an error each time it is read *except* when mispronunciation is a plausible pronunciation of a proper noun, which is then counted as correct

Dependent variables. From the literature we identified skills and abilities that contribute to reading in general, and to ORF specifically, and formed an assessment battery of the following instruments:

- Wechsler Adult Intelligence Scale III (WAIS) Block Design, Information, Vocabulary subtests (Wechsler, 1997)
- Comprehensive Test of Phonemic Processing (CTOPP) Elision, Blending Non-words, Rapid Color Naming, and Rapid Letter Naming subtests (Wagner, Torgesen, & Rashotte, 1999)
- Test of Word Reading Efficiency (TOWRE) Sight Word Efficiency and Phonemic Decoding Efficiency tests (Torgesen, Wagner, & Rashotte, 1999)
- Test of Silent Word Reading Fluency (TOSWRF) (Mather, Hammill, Allen, & Roberts, 2004)
- Clinical Evaluation of Language Fundamentals (CELF) listening comprehension subtest (Semel, Wiig, & Secord, 1987)
- Woodcock-Johnson III (WJ3-AWM) *Auditory Working Memory* subtest (Mather & Woodcock, 1998)
- Peabody Picture Vocabulary Test-III (PPVT) (Dunn & Dunn, 1997)
- Woodcock Reading Mastery Tests-Revised (WRMT-R) Word Attack, Word Identification and Passage Comprehension subtests (Woodcock, 1998)
- Comprehensive Adult Student Assessment System Reading Test Level C-advanced basic skills subtest (CASAS, 2001) converted to NRS levels.

We also computed a pro-rated IQ composite variable from the three WAIS subtests using the procedures specified in Sattler (2001).

Procedures

  Data collection. Trained examiners individually administered the assessments. Learners received a $50 payment for participating. Examiners completed a procedural administration validity checklist, and a data handling team followed a protocol for ensuring the records were complete and accurate, including inter-rater reliability and validity checks.

  Statistical analyses. We created a scatter plot of twpm and wepm data (Figure 2), and observed sufficient differences to form four groups using median splits (*Mdn* = 119 twpm; *Mdn* = 8.5 wepm). For comparison, students in 9th through 12th grade normally read between 180 and 200 correct words per minute (Adams & Brown, 2004; Hasbrouk & Tindal, 1992).

Figure 2
Total Word Rate by Word Error Rate
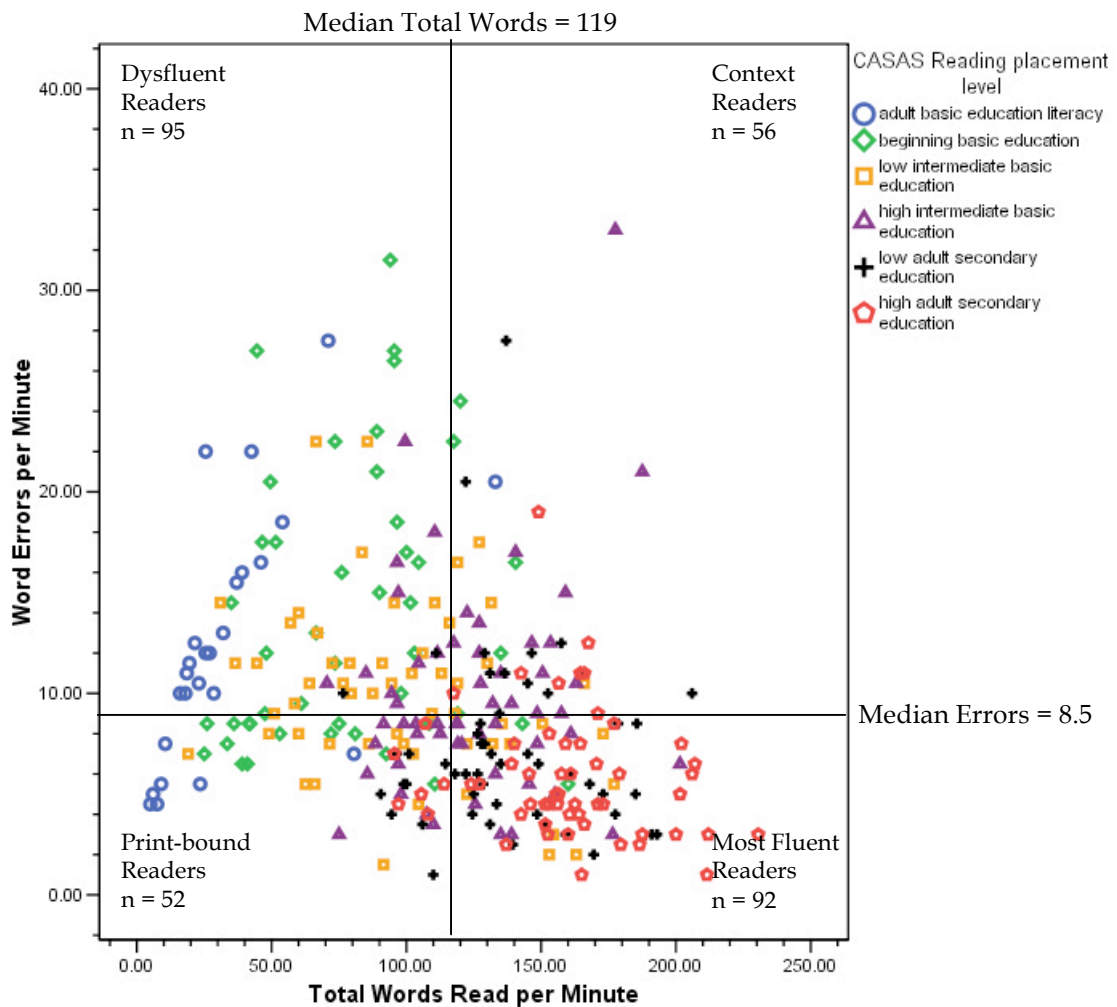
Learners with scores at or above the twpm median and below the wepm median formed the group we labeled Most Fluent Readers (MFR). For relatively speedy but inaccurate readers with scores at or above the median for both variables, we borrowed Harris and Sipay's (1990) term, Context Readers (CR). Relatively slow and accurate readers with scores below the median

for both variables we labeled Print-bound Readers (PR; Harris & Sipay). Slow and inaccurate readers with scores below the twpm median and at or above the wepm median, we labeled Dysfluent Readers (DR).

We evaluated the dependent variables for significant differences among and patterns within the four groups. We performed a one factor multivariate analysis of covariance (MANCOVA) to better understand the relationships between group membership and dependent variables that were not rate-based. We considered gender, age, and intelligence as potential covariates because of differences we observed in the groups' demographic profiles. After examining correlation data, we found age and gender had little or no correlation with the dependent variables, and eliminated them from the MANCOVA.

We chose Block Design as the measure of intelligence because, of the three WAIS subtests that we administered, it is least related to language abilities and reading. Intelligence was treated as a continuous covariate in the analysis. For all dependent variables we used raw scores.

Results

Group profiles. For each group, Table 3 presents mean scores for the two defining variables—twpm and wepm—as well as mean age and gender distribution. Tables 4 and 5 presents the mean score by group for each measure in our reading battery.

Table 3
Fluency Measures and Age Means and Standard Deviations and Gender Distribution by Group

Measure	Most Fluent Readers (MFR)	Context Readers (CR)	Print-bound Readers (PBR)	Dysfluent Readers (DR)	Total
Total words per minute mean (*SD*)	156.1 (25.4)	145.8 (20.1)	77.4 (34.3)	73.6 (30.8)	113.7 (47.9)
Word errors per minute mean (*SD*)	5.1 (1.9)	12.7 (5.1)	6.0 (1.7)	13.9 (5.3)	9.5 (5.6)
Correct words per minute					104.2
(percent accuracy)	151.0 (96.8%)	133.1 (91.3%)	71.5 (92.4%)	59.8 (81.2%)	91.7%
Age mean (*SD*)	25.2 (10.6)	29.5 (13.8)	33.6 (15.2)	36.8 (15.7)	31.2 (14.6)
Female (percent of group)	64.1%	76.8%	51.9%	50.5%	60.0%
N	95	56	52	95	295

Table 4
Intellectual Ability, Listening and Memory and Vocabulary Mean and Standard Deviations by Group

Measure	Most Fluent Readers (MFR)		Context Readers (CR)		Print-bound Readers (PBR)	Dysfluent Readers (DR)		Total
	Mean score (Standard Deviation)							
					Intellectual ability			
WAIS Block Design	34.8	(12.8)	26.9	(12.0)	24.8 (13.0)	23.2	(10.5)	27.8 (12.9)
WAIS Information	11.5	(4.4)	9.6	(3.6)	8.9 (4.1)	8.6	(3.1)	9.7 (4.)
WAIS pro-rated IQ	90.3	(12.0)	81.5	(11.6)	77.5 (11.3)	75.7	(9.1)	81.6 (12.5)
					Listening and memory			
CELF listening comprehension	8.2	(3.4)	7.2	(3.1)	5.2 (2.9)	6.0	(3.3)	6.7 (3.4)
WJ Auditory Working Memory	28.3	(5.3)	23.8	(7.0)	20.9 (5.9)	17.8	(7.6)	22.7 (7.8)
					Vocabulary			
Peabody Picture Vocabulary Test	163.9	(17.9)	157.7	(16.9)	147.7 (21.9)	148.8	(18.2)	155.0 (19.7)
WAIS Vocabulary	29.7	(10.8)	24.1	(9.6)	19.6 (8.7)	18.4	(7.7)	23.2 (10.4)

Table 5
Phonemic Awareness, Processing Speed, Word-level Skills, and Reading Comprehension Mean and Standard Deviations by Group

Measure	Most Fluent Readers (MFR)		Context Readers (CR)	Print-bound Readers (PBR)		Dysfluent Readers (DR)		Total
	Mean score (Standard Deviation)							
				Phonemic awareness				
CTOPP Elision	15.1	(4.6)	10.8 (5.3)	7.6	(4.6)	6.9	(4.3)	10.3 (5.8)
CTOPP Blending Non-words	8.5	(2.8)	6.4 (4.0)	5.2	(3.4)	3.9	(3.6)	6.1 (3.9)
				Processing speed				
CTOPP Rapid Color Naming	41.0	(7.3)	43.7 (8.1)	61.6	(22.7)	58.5	(20.4)	50.6 (18.1)
CTOPP Rapid Letter Naming	26.8	(4.4)	28.7 (5.0)	39.6	(11.5)	39.7	(14.8)	33.6 (11.9)
				Word-level skills				
TOWRE Phonemic Decoding Efficiency	39.1	(10.4)	29.6 (11.3)	17.8	(11.8)	9.7	(9.5)	24.5 (16.2)
WRMT-R Word Attack	32.8	(5.9)	25.3 (8.4)	19.5	(10.8)	11.9	(9.4)	22.4 (12.1)
TOWRE Sight Words Efficiency	81.3	(9.8)	76.2 (9.3)	51.1	(18.9)	46.8	(16.3)	63.7 (21.0)
WRMT-R Word Identification	86.3	(7.7)	77.7 (8.5)	62.2	(20.0)	54.6	(16.1)	70.3 (19.1)
TOSWRF Silent Word Reading Efficiency	116.6	(29.4)	99.7 (24.2)	64.9	(31.3)	64.9	(30.1)	87.7 (37.2)
				Reading comprehension				
WRMT-R Passage Comprehension	48.2	(6.8)	42.8 (9.1)	31.3	(12.6)	26.9	(11.8)	37.4 (13.6)

Group by NRS level. Table 6 presents the distribution of group members by NRS levels. Each group contained individuals who were placed in at least five of the six NRS levels.

Table 6
National Reporting System Level Distribution within Fluency Ability Group

NRS level	Most Fluent Readers (MFR)		Context Readers (CR)		Print-bound Readers (PBR)		Dysfluent Readers (DR)		Total	
	Number in group (percent of group)									
Level 1	0	0%	1	(2%)	7	(14%)	**17**	**(18%)**	25	(9%)
Level 2	1	(1%)	5	(9%)	9	(17%)	**31**	**(33%)**	46	(16%)
Level 3	9	(10%)	8	(14%)	12	(23%)	**27**	**(28%)**	56	(19%)
Level 4	13	(14%)	**19**	**(34%)**	9	(17%)	16	(17%)	57	(19%)
Level 5	**28**	**(30%)**	15	(27%)	10	(19%)	2	(2%)	55	(19%)
Level 6	**41**	**(45%)**	8	(14%)	5	(10%)	2	(2%)	56	(19%)
Total	92	(100%)	56	(100%)	52	(100%)	95	(100%)	295	(100%)

Note: Numbers in bold face type represent the largest fluency group in each NRS level.

MANCOVA. Table 7 presents the MANCOVA main effects of controlling for intellectual ability using Block Design as a covariate with group. The analysis excludes pro-rated IQ as a dependent variable because it is a composite score. Also excluded are the rate-based variables of Rapid Color Naming and Letter Naming, Phonemic Decoding Efficiency, Sight Word Efficiency, and Silent Word Reading Efficiency because the groups were formed using rate-based variables.

After controlling for intellectual ability, significant variance existed between groups on all but one dependent variable. The dependent variables with statistical differences by group were Word Identification, $F(3, 292) = 63.264$, $p = .00$; Word Attack, $F(3, 292) = 63.113$, $p = .00$; and Passage Comprehension, $F(3, 292) = 49.484$, $p = .00$. Lack of significance for the Information variable, $F(3, 292) = 2.378$, $p = .07$, may be due to the Block Design covariate accounting for similar elements of the variance.

Table 7

Multivariate Analysis of Covariance (MANCOVA) by Fluency Ability Group and Intelligence

Source	Dependent Variable	df	F	η^2	p
Fluency Ability Group	WRMT-R Word Identification	3	63.264	.425	.000
	WRMT-R Word Attack	3	63.113	.424	.000
	WRMT-R Passage Comprehension	3	49.484	.366	.000
	CTOPP Elision	3	32.863	.277	.000
	WJ-Auditory Working Memory	3	19.700	.187	.000
	CTOPP Non-word Blending	3	15.560	.154	.000
	WAIS Vocabulary	3	10.855	.112	.000
	PPVT-3	3	4.479	.050	.004
	CELF Listening Comprehension	3	4.457	.049	.005
	WAIS Information	3	2.378	.027	.070
WAIS Block Design	CTOPP Elision	1	42.873	.143	.000
	WRMT-R Passage Comprehension	1	38.665	.131	.000
	WAIS Information	1	35.351	.121	.000
	WAIS Vocabulary	1	33.986	.117	.000
	PPVT-3	1	31.694	.110	.000
	WJ Auditory Working Memory	1	27.099	.095	.000
	CTOPP Blending Non-words	1	24.749	.088	.000
	WRMT-R Word Identification	1	17.929	.065	.000
	WRMT-R Word Attack	1	16.412	.060	.000
	CELF Listening Comprehension	1	14.760	.054	.000

Bonferroni post hoc tests of groups show that MFR was the most distinct group as it differed from PR and DR on every variable, and from CR on nearly every variable. The largest Cohen's *d* effect sizes between MFR and DR were Passage Comprehension κ = 2.227, Word Identification κ = 2.504, Word Attack κ = 2.663, and Elision κ = 1.857. Between MFR and PR greatest differences were in Passage Comprehension κ = 1.678, Word Identification κ = 1.578, Word Attack κ = 1.525, and Elision κ = 1.632. Differences between MFR and CR were less pronounced, however still significant for all variables except CELF and PPVT, with the largest effect sizes for Word Identification κ = 1.052 and Word Attack κ = 1.042.

CR differed from PR on only four variables with effect sizes of Passage Comprehension $\kappa = 1.051$, Word Identification $\kappa = 1.008$, Word Attack $\kappa = .593$, and CTOPP Elision $\kappa = .650$. CR differed from DR on almost every variable, excluding CELF and Information, with the largest effect sizes for Passage Comprehension $\kappa = 1.516$, Word Identification $\kappa = 1.791$, and Word Attack $\kappa = 1.499$.

PR and DR were the most similar to each other; the only discriminating variable between these two lowest performing groups was Word Attack, $\kappa = 0.751$.

Strengths and weaknesses within groups. Relative to the other learners in the sample, MFR's strongest abilities were word-level skills and phonemic awareness. Areas in which MFR displayed the least ability were listening comprehension, information, and picture vocabulary. CR's strongest abilities were sight word reading, rapid naming, and reading comprehension. CR scored near or below the sample mean in information, vocabulary, and elision tests. PR's greatest abilities were phonetic skills and non-reading tasks; their greatest skill deficits were in rate-related activities. DR's highest abilities were the three lowest abilities for MFR, that is, listening comprehension, informational, and picture vocabulary. Conversely, the abilities DR least demonstrated were word-level skills, which were strengths of MFR.

Correlations. High correlations exist between the grouping variables and many of the dependent variables. The dependent variables most associated with twpm were Sight Word Efficiency ($r_{xy} = .92$), Word Identification ($r_{xy} = .89$), Passage Comprehension ($r_{xy} = .82$), and Phonemic Decoding Efficiency ($r_{xy} = .81$). The dependent variables most associated with wepm were Word Attack ($r_{xy} = -.54$), Phonemic Decoding Efficiency ($r_{xy} = -.47$), Word Identification ($r_{xy} = -.45$), and Passage Comprehension ($r_{xy} = -.45$).

Discussion

The results demonstrate that the four groups formed on the basis of total word and word error rates are distinct from one another in underlying abilities that contribute to reading ability (e.g., intellectual ability, phonemic awareness, processing speed, listening, memory) as well as in knowledge or performance directly related to reading (e.g., vocabulary, word-level skills, comprehension). These distinctions remained even after we controlled for differences in general intellectual ability. Furthermore, these groups did not parallel NRS educational functional level, the classification scheme by which many AE programs determine instructional curriculum and goals. This finding underscores the limits of relying on any one measure (e.g., TABE or CASAS) or component (e.g., reading comprehension) to represent a learner's knowledge and skills. Lastly, the groups' relative strengths and weaknesses indicate possible explanations for the differences among groups as well as suggest instructional priorities for each group. Therefore, we believe fluency grouping may be a helpful way to assess overall reading ability as well as plan and evaluate instruction of adults with low literacy.

As we considered what we learned about each of the groups, we were not surprised to note that the MFR group had the highest ability scores, most phonemic awareness, fastest processing speed, keenest listening memory and comprehension, largest vocabulary, best word recognition and attack skills, and highest reading comprehension. Three-quarters of this group

were classified in NRS levels 5 or 6, indicating they were near to GED attainment. Yet they had only 5th grade instructional level ORF rate with a frequency of word errors that fell within acceptable range (i.e., less than 5% of total words; Sundbye, 2001), and WRMT-R subtest scores with grade equivalencies around 8th grade. These individuals seemed to have achieved this level of reading proficiency through word recognition skills, both phonetic and sight word reading skills. The reason for their status as low-literacy adults may be explained by lack of opportunity, or prior instruction that failed to build knowledge, vocabulary, memory, or inferential abilities. Because Samuels and Wu (2003) found higher ability students benefited from more reading practice, we speculate this group of learners would likely benefit from instruction that includes a wide array of reading materials to increase background knowledge and vocabulary, as well as strategy instruction for building memory capacity and the ability to draw inferences.

CR performed nearly as well as MFR on both rapid naming measures and the silent word reading efficiency test, but lower on all other measures. Even with about twice the amount of acceptable word errors, about 40% of these readers were placed in NRS Level 4, which equates to 8th grade. The relative strengths of this group were sight word and passage comprehension scores at about 6th grade level. However, their word attack skills were about 4th grade level. Perhaps for many in this group their word errors did not change meaning, thus helping them to comprehend better than DR readers, who had similar word error rates (Pinnell, 2002). Nevertheless, the absence of word attack skills may relegate the CR group to low-literacy status, even more so than does limited vocabulary or lack of background knowledge. For this group, increased reading practice to improve fluency may not help, and could possibly hurt by reinforcing bad habits (e.g., over using context cues, ignoring graphic cues, elisions). Instruction that helps these readers attend to the details of a text—whole words, letters in words, punctuation—may be the most helpful for developing fluency and reading proficiency. We suggest extensive practice in applying those skills in controlled textual materials at first, and later in a wider array of materials to build knowledge and vocabulary. Instructors should also consider the participants' interests in selecting those prose materials.

PR, who were categorized into nearly every NRS level, read at about a 2nd grade rate although with more than an acceptable word errors, and demonstrated about 3rd grade abilities on the WRMT-R subtests. They were very similar to DR learners in measures of intellectual ability, processing speed, vocabulary, and listening skills, but had better phonemic awareness and word recognition abilities. Their apparent ability to decode words is outweighed by their slower processing speed, which may be a demonstration of the limited capacity theory of reading (Lesgold & Perfetti, 1978; Perfetti, 1985). Instruction that develops word recognition automaticity (e.g., sight words, context cues) may be a priority, with subsequent reading practice to improve processing speed.

The DR group learners were most often classified in the lowest NRS levels, had a 1st or 2nd grade rate with nearly four times the acceptable level of word errors, and 2nd grade equivalent WRMT-R subtest scores. They were weakest in both word decoding and sight word skills, yet had relative strengths in listening memory and inference skills, prior knowledge, and picture vocabulary. In some instances, while still low performing, they scored as well or better than PR in tasks that did not require word recognition or decoding. With children who performed at this level, Pikulski's (2006) approach to fluency would emphasize acquisition of

alphabetic skills before increasing their reading volume. However, if these adults are part of the 25-30% of the population who lack a component of phonemic awareness termed comparator function—"an ability to hold a phoneme and/or syllable segments of two phonological structures in mind and compare and represent any variations in the number, identity, or order of their segments" (Lindamood, Bell, & Lindamood, 1992, p. 242)—more than simple phonics instruction will be needed. Most likely a more comprehensive assessment of phonemic awareness and targeted, intensive interventions would be needed for these readers.

Application of ORF measures with adults. The two-minute oral reading assessment that we used to group low-literacy adults could be used to make initial instructional decisions for adult learners. Further, the median twpm and wepm rates we identified in this study could be used for ongoing progress monitoring and instructional needs as the learners become more fluent. For example (Figure 3), a learner who enters adult literacy instruction reading less than 119 twpm with fewer than 8.5 wepm could begin instruction appropriate for a print-bound reader. An educator could easily monitor whether an instructional plan aimed at developing word recognition automaticity was helping the learner increase twpm without increasing wepm. If errors became unacceptably high, the educator could adjust instruction.

Figure 3
Oral Reading Fluency Progress Monitoring Chart
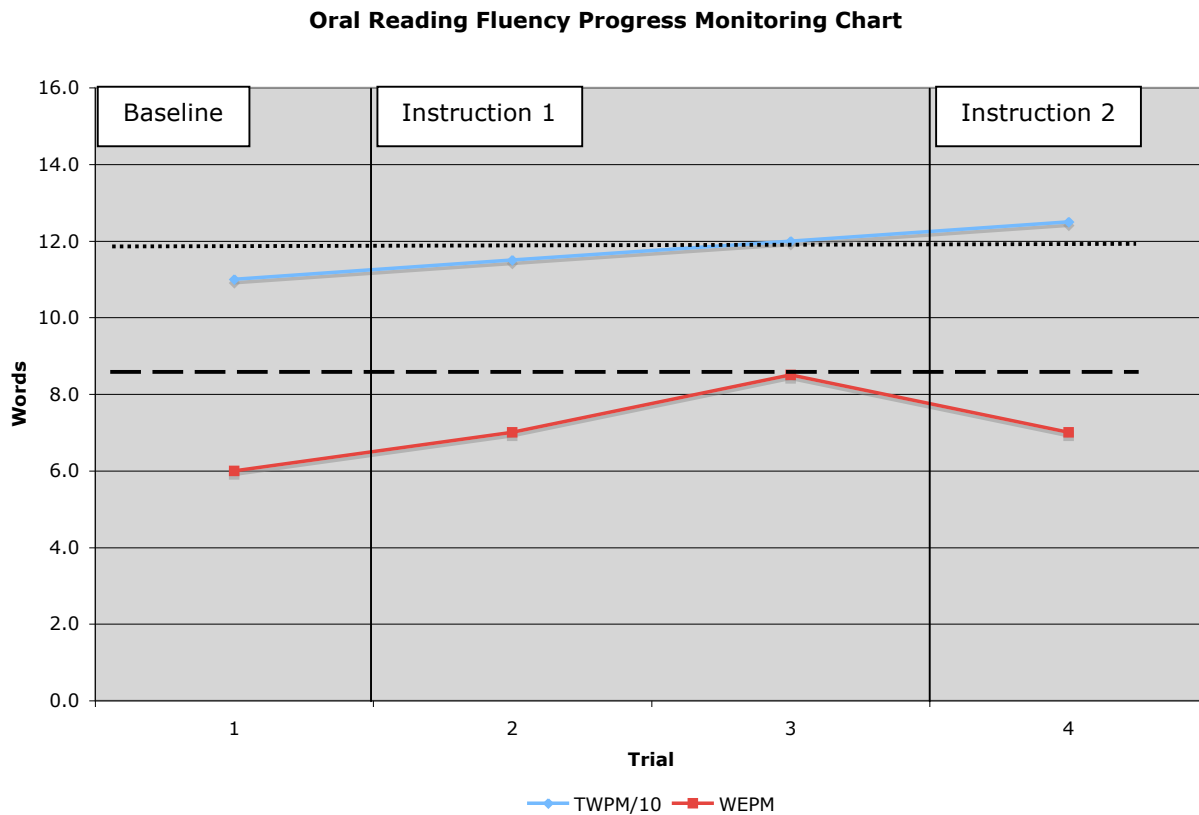
Limitations

Our sample was drawn from adults volunteers already enrolled in AE programs, which implies motivation to improve literacy skills and educational credentials. Further, these learners were from one region of the country. We await the results of the National Assessment of Adult Literacy (NAAL) fluency survey to indicate the degree to which our results are representative of other adults with low literacy.

Future research

Given the distinct fluency groups identified in this exploratory analysis, future research may validate instructional methods and curriculum for use with each group. We anticipate that additional experimental and descriptive studies can help disentangle the relationship of skill level and the value of targeted interventions. Further studies with other adult populations may validate the median cut scores we suggest here for instructional grouping and progress monitoring.

Conclusion

Adult educators may be able to help many learners achieve greater reading proficiency by turning attention to ORF. The data indicate that adults reading at a comparable correct word rates can have widely varied total word and word error rates. These differences were evidenced across other reading components, adult education placement levels, and general ability levels. By using two indicators of ORF—total words per minute and word errors per minute—a fairly clear picture of a learner's current reading abilities emerges and suggests emphases for initial instruction. Further study may help us understand the attentional, memory, language, and strategic components associated with these differences and lead to improved curricular and instructional models.

References

Aaron, P. (2006, July). The validity of the Component model of reading: Outcome of an instructional procedure. Paper presented at the meeting of the Society for the Scientific Study of Reading, Vancouver, Canada. Retrieved July 18, 2006 from http://www.triplesr.org/conference/docs/06Abstracts-060702.htm.

Adams, G., & Brown, S. (2004). *The six-minute solution: A reading fluency program*. Longmont, CO: Sopris West Educational Services.

Allington, R. (1983). Fluency: The neglected reading goal. *The Reading Teacher, 36*, 556-561.

Catts, H., Hogann, T., & Adlof, S. (2005). Developmental changes in reading and reading disabilities. In H. Catts & A. Kamhi (Eds.), *The connection between language and reading disabilities book title* (pp. 25-40), Mahwah, NJ: Erlbaum.

Comprehensive Adult Student Assessment System (CASAS). (2001). *CASAS Technical Manual*. San Diego, CA: Author.

Dunn, L., & Dunn, L. (1997). *Peabody Picture Vocabulary Test-Ill*. Circle Pines, MN: American Guidance Service.

Flood, J., Lapp, D., Fisher, D. (2005) Neurological impress method plus, *Reading Psychology: An International Quarterly, 26*(2), 147-160.

Fuchs, L., Fuchs, D., Hosp, M., & Jenkins, J. (2001). Oral reading fluency as an indicator of reading competence: A theoretical, empirical, and historical analysis. *Scientific Studies of Reading, 5*(3), 239–256.

Good, R. & Kaminski, R. (2002). *Dynamic Indicators of Basic Early Literacy Skills* (6th ed.). Eugene, OR: Institute for the Development of Educational Achievement. Retrieved June 7, 2006 from http://dibels.uoregon.edu/measures/orf.php.

Harris, T., & Hodges, R. (1995). *The literacy dictionary*, Newark, DE: International Reading Association.

Harris, A. & Sipay, E. (1990). *How to increase reading ability: A guide to developmental & remedial methods*. White Plains, NY: Longman.

Hasbrouck, J., & Tindal, G. (1992). Curriculum-based oral reading fluency norms for students in Grades 2 through 5. *Teaching Exceptional Children, 24*(3), 41-44.

Hoover, W. & Gough, P. (1990). The simple view of reading. In C. Cornoldi & J. Oakhill (Eds.), *Reading comprehension difficulties* (pp. 1-13), Mahwah, NJ: Erlbaum.

Jenkins, J., Fuchs, L., van den Broek, P., Espin, C., & Deno, S. (2003). Accuracy and fluency in list and context reading of skilled and RD groups: Absolute and relative performance levels, *Learning Disabilities Research & Practice, 18*(4), 237-245.

Kail, R., & Salthouse, T. (1994). Processing speed as a mental capacity. *Acta Psychologica, 86*(2/3), 199-225.

Kruidenier, J. (2002). *Research-based Principles for adult basic education reading instruction*. Washington, DC: National Institute for Literacy.

Kutner, M., Greenberg, E., Baer, J. (2006). *National Assessment of Adult Literacy (NAAL): A first look at the literacy of America's adults in the 21st century*. (Report No. NCES 2006-470). Washington, DC: National Center for Educational Statistics.

Leslie, L. & Caldwell, J. (2001). *Qualitative reading inventory, 3*. New York: Addison Wesley Longman, Inc.

Lindamood, P. Bell, N., & Lindamood, P. (1992). Issues in phonemic awareness assessment. *Annals of Dyslexia, 42*, 242-259.

Mather, N., Hammill, D., Allen, E. & Roberts, R. (2004). *Test of Silent Reading Word Proficiency*. Austin, TX: PRO-ED.

Mather, N. & Woodcock, R. W. (1998). *Woodcock Johnson-III*. Itasca, IL: Riverside Publishing Company.

National Center for Family Literacy (2005). *Applying research in reading instruction for adults*. Louisville, KY: Author.

National Institute of Child Health and Human Development (2000). *Report of the National Reading Panel. Teaching children to read: An evidenced-based assessment of the scientific research literature on reading and its implications for reading instruction. Reports of the subgroups*. (NIH Publication No. 00-4754). Washington, DC: U.S. Government Printing Office.

Pikulski, J. & Chard, D. (2005). Fluency: Bridge between decoding and reading comprehension. *The Reading Teacher*, *58*(6), 510-519.

Pinnell, G., Pikulski, J., Wixson, K., Campbell, J., Gough, P., & Beatty, A. (1995). *Listening to children read aloud: Data from NAEP's integrated reading performance record (IRPR) at grade 4*. Washington, DC: National Center for Educational Statistics, Office of Research and Improvement, U.S. Department of Education.

Pressley, M., Gaskins, I., & Fingeret, L. (2006). Instruction and development of reading fluency in struggling readers. In S.J. Samuels & A.E. Farstrup (Eds.), *What research has to say about fluency instruction*. (pp. 4-23). Newark, DE: International Reading Association.

Rasinski, T. (2006). A brief history of reading fluency. In S.J. Samuels & A.E. Farstrup (Eds.), *What research has to say about fluency instruction*. (pp. 4-23). Newark, DE: International Reading Association.

Rasinski, T. & Zutell, J. (1996). Is fluency yet a goal of the reading curriculum? In E.G. Sturtevant and W.M. Linek (Eds.), *Growing literacy* (18th yearbook of the College Reading Association, pp. 237-246). Harrisburg, VA: College Reading Association.

Sabatini, J. (2002). Efficiency in word reading of adults: Ability group comparisons. *Scientific Studies of Reading*, *6*(3), 267-298.

Samuels, S. (2006). *Toward a model of reading fluency*. In S.J. Samuels & A.E. Farstrup (Eds.), *What research has to say about fluency instruction*. (pp. 24-46). Newark, DE: International Reading Association.

Samuels, S. & Wu, Y. (2003). *How the amount of time spent on independent reading affects reading achievement: A response the National Reading Panel*. Retrieved June 7, 2006 from http://www.tc.umn.edu/~samue001.

Sattler, J. (2001). *Assessment of children: Cognitive applications (4th ed.)*. LaMesa, CA: Jerome M. Sattler, Publisher, Inc.

Semel, E., Wiig, E., & Secord, W. (1987). *Clinical Evaluation of Language Fundamentals* (Rev. ed.). San Antonio, TX: The Psychological Corp.

Stanovich, K. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 22*, 360-406.

Strucker, J. & Davidson, R. (2003, November). *Adult reading components study (ARCS)*. Retrieved July 19, 2006 from http://www.ncsall.net/fileadmin/resources/research/brief_strucker2.pdf.

Sundbye, N. (2001). *Assessing the struggling reader: What to look for and how to make sense of it*. Lawrence, KS: Curriculum Solutions, Inc.

Torgesen, J., Wagner R., & Rashotte C. (1999). *Test of word reading efficiency (TOWRE)*. Austin, TX: Pro-ed.

U.S. Department of Education (USDE). (2004). *Enrollment and Participation in the State-Administered Adult Education Program*. Washington, DC: Office of Adult and Vocational Education, Division of Adult Education and Literacy. Retrieved June 10, 2005, from http://www.ed.gov/about/offices/list/ovae/pi/AdultEd/aedatatables.html

Wagner, R., Toregesen, J., & Rashotte, C. (1999). *The Comprehensive Test of Phonemic Processing*. Austin, TX: Pro-ed.

Wechsler, D. (1997). *Manual for the Wechsler Adult Intelligence Scale* (3rd ed.). San Antonio, TX: The Psychological Corporation.

White, O. & Haring, N. (1976). *Exceptional Teaching*. Columbus, OH: Charles E. Merrill Publishing Co.

Wolf, M. & Katzir-Cohen, T. (2001). Reading fluency and its intervention. *Scientific Studies of Reading*, 5(3), 211-239.

Woodcock, R. (1998). *Woodcock Reading Mastery Tests—Revised: Examiner's Manual*. Circle Pines, MN: American Guidance Service, Inc.