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ASSESSMENT OF READING RATE IN POSTSECONDARY STUDENTS

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There has been a steady increase in students with disabilities attending college and making requests for test accommodations. Most requests are for extended time, presumably due to slow reading speed. Tests of reading rate for adults have been criticized for poor psychometric adequacy, and no current norms exist regarding the expected reading rate for college students. This study examined reading rate via two methods, as well as their relationship to other reading measures. Ninety typical college students (67% female) were administered the Nelson Denny Reading Test (Reading Rate [NDRR] and Comprehension [NDC] tests), the Woodcock Johnson–III Reading Fluency (RF) and Word Attack (WA) tests, and three oral reading probes used to obtain words read correctly per minute (WRCM). On average, college students read 189 words correctly per minute based on oral reading probes and 231 wpm based on NDRR. The WRCM measure was more strongly related to RF and WA than was NDRR and was a better predictor of reading comprehension (NDC). It would appear that WRCM may be a better measure of reading rate than the often used, much criticized, Nelson Denny Reading Rate. Additional research on WRCM with adults is recommended.

The last 20 years have witnessed a marked increase in the number of individuals with disabilities in postsecondary educational settings. Whereas 2.6% of full-time freshman college students carried a disability designation in 1978, 9.2% were designated with a disability in 1994 (Henderson, 1995). Among these students, learning disability is the most common designation. Vogel and colleagues (1998) reported estimates ranging from 0.5% to almost 10% for the proportion of all college students with learning disabilities. Consistent with this increase has been an increase in the number of postsecondary educational institutions offering services for students with learning disabilities. In 1981 there were a handful of colleges that offered disability services, but by 1992 there were over 1,000 such programs.

The increase in students with disabilities in college is mirrored by landmark changes in antidiscrimination legislation for those with disabilities. From the Rehabilitation Act of 1973 to the Americans with Disabilities Act of 1990, the government has strengthened legislation against discrimination on the basis of disability. These changes have fostered an increase not only in services for students with disabilities but also in the number of test accommodations requested in postsecondary schools and for professional examinations (LSAT, MCAT, bar exams, medical board exams, etc.).

The increase in test accommodation requests has had a ripple effect that includes a greater demand for psychoeducational assessments of adults and more pressure on schools and test agencies to process and evaluate the requests. Test agencies such as the National Board of Medical Examiners and various state law boards have indicated that most requests are made by individuals with presumed learning disabilities or attention deficit disorders. A majority of those with learning disabilities have reading disorders. The agencies report that "extended time" is by far the most requested accommodation (Keiser, 1998). Many of the applicants for test accommodations note that slow reading speed is responsible for their difficulty in taking tests. Consequently, clinicians who perform accommodation assessments often rely on measures of reading rate to provide evidence of significant reading impairment.

The literature on adult reading rates is rather sparse. For example, there are no established reading rate norms (O'Reilly, 1990), and methods for evaluating reading rate are quite varied, as are the operational definitions of reading rate. Some estimates of typical reading rate for college students are as high as 300-400 words per minute (wpm) (Carver, 1990), whereas others are approximately 200 wpm (Just & Carpenter, 1980). As Carver (1990) noted, the type of reading employed affects the reading rate, whether a person is scanning, skimming, "rauding" (reading for understanding without overtly trying to learn the material), learning, or memorizing. Meyer and Talbot (1998) also demonstrated that reading rates are widely variable across readers within a task (up to 85 wpm), begging the question of what strategies and styles readers bring to a reading task. Therefore, it is difficult to determine an *optimal* reading rate for an adult even if the reading task is a standardized reading comprehension test.

Some investigators (Carver 1982; Kintsch & van Dijk, 1978) have argued that reading comprehension breaks down at slow reading rates (< 100 wpm). Others (Foulke, 1971; Hausfield, 1981; Legge, Ross, Maxwell, & Luebker, 1989) have noted that comprehension decreases at higher reading rates (> 275 wpm). Meyer and colleagues found that in self-paced reading on a recall task, young adults read at an average of 144 wpm (Meyer & Rice, 1989) and 136 wpm (Meyer, Young, & Bartlett (1989). Meyer, Talbot, and Florencio (1999) concluded that there may be a general range of speed that best suits most college students on a prose retrieval task (136 to 200 wpm). Thus it appears that reading too fast or too slowly may have an untoward effect on reading comprehension. Regardless of what reading rate seems typical or optimal for adults, the measurement of reading rate is complicated by variables such as reading purpose, text length, readability, interest level, task instructions, and the method of assessment.

There are few standardized methods for measuring reading rate in adults. According to Gordon and Flippo (1983), the most widely utilized measure of adult reading is the Nelson Denny Reading Test (NDRT). The NDRT is essentially a measure intended to quickly capture adult students' reading levels and screen for those who may benefit from remedial as well as accelerated services. It is not validated for purposes of individual diagnosis. Yet, in the absence of other reading rate measures, many clinicians use the NDRT diagnostically. The

Reading Rate subtest involves 1 minute of silent reading of a standard (nongraded) passage. The reader puts a mark at the end of the line he or she is reading after 1 minute. The passage is actually part of the comprehension subtest, so the reading rate assessment is incidental and embedded in another subtest. Examinees are not given instructions as to how to approach the task and they receive no practice. Despite the popularity of this measure, critics have noted the poor reliability of the Reading Rate measure in particular and cautioned that the test be used for screening as originally intended (Cummins, 1981; Perkins, 1984).

A common method of assessing reading fluency in children follows procedures of curriculum based measurement (CBM). The CBM method involves the administration of reading passage probes to determine how many words a student reads correctly in 1 minute. Reading is performed orally, and the examiner subtracts misread words from word total to arrive at the "words read correctly per minute" (WRCM) score. Sometimes multiple probes are presented and the median number of WRCM is recorded. Fuchs, Tindal, and Deno (1984) noted that the CBM method is highly reliable and correlates strongly with reading comprehension. At present, this type of CBM method has not been applied to the assessment of adult reading rate.

The purpose of this study was to examine two methods that assess reading fluency, the NDRT and CBM. We were interested in the average reading rate of college students using these two measures. We were also curious how these measures would relate to other diagnostic measures of reading (Woodcock Johnson–III Reading Fluency and Word Attack subtests). Lastly, we explored the ability of the various reading measures to predict the outcome measure of reading comprehension.

METHOD

Participants

An initial sample of 110 students was recruited from a large psychology class ($N = 800$) at a private university in the Northeast. Participants received a form of course credit for participation. Of the original group, 17 students were eliminated due to self-reported history of learning disability or attention disorder or because they spoke English as a second language. Three students were eliminated as outliers, suggesting that the students were very impaired readers or were not trying their best. Of the remaining 90 volunteers, 66.7% were female ($n = 60$) and 53.3% were freshman ($n = 48$). Participants ranged in age from 18 to 26, with an average age of 19.1 years. The sample was predominantly Caucasian (82.2%) but included individuals identifying themselves as African American (6.7%), Asian American (3.3%), and Latin American (5.6%). Hollingshead's four-factor index was used as an estimate of socioeconomic status, yielding a mean of 42.14 ($SD = 9.00$). This indicated that the sample was skewed toward middle to upper class of socioeconomic status. Because the majority of participants were college freshmen, many did not yet have a grade point average. However, the sample had an average self-reported SAT score of 1181 ($SD = 103.62$), suggesting above-average cognitive and academic func-

tioning. Table 1 summarizes the demographic characteristics of the sample.

Table 1
Sample Demographics

	n	%
Gender		
Male	30	33.3%
Female	60	66.7%
Ethnicity		
Caucasian	74	82.2%
African American	6	6.7%
Asian American	3	3.3%
Latin American	5	5.6%
Other	2	2.2%
Year in College		
Freshman	48	53.3%
Sophomore	29	32.2%
Junior	7	7.8%
Senior +	6	6.6%

Measures

Demographic questionnaire. A demographic questionnaire was administered to ascertain basic characteristics of the study sample, including age, gender, year in college, ethnicity, SAT scores, and parents' education level.

Nelson Denny Reading Test, Form G, Comprehension and Reading Rate subtests. The Comprehension and Reading Rate subtests of the Nelson-Denny Reading Test (NDRT; Brown, Fishco, & Hanna, 1993) were administered to assess reading comprehension proficiency and speed of silent reading, respectively. The Comprehension subtest (NDC) consists of seven passages with a total of 38 accompanying comprehension questions. Examinees are given 20 minutes to read the passages silently and answer factual and inferential multiple-choice questions. The Reading Rate subtest (NDRR) is based on the first minute of reading for Comprehension. Administration time for these sections is limited to 20 minutes total. The NDRT was used in this investigation because it is a common measure of reading performance in adults. However, the psychometric qualities of the NDRT are questionable, because evidence supporting its technical adequacy is limited. The authors report an adequate reliability coefficient of .81 for alternate forms (Forms G+H, 1993) but do not provide any empirical evidence for test-retest reliability. With regard to the Reading Rate subtest, the NDRT manual reports a weak reliability coefficient of .69. The lack of stability in the Reading Rate scores makes its utility questionable. The Reading Rate measure also lacks evidence of validity (Rudner, 1991).

Oral reading fluency (CBM). Three oral reading probes were obtained from the first passage in three forms of the NDRT (Forms E, F, & H). Each passage was at least 300 words long and was similar in readability (at or below an 8th-grade level) based on the Dale-Chall (1948) readability index. Participants read each passage aloud, and the examiner noted reading errors in accordance

with Shapiro's (1996) criteria. For each participant, the median number of words read correctly per minute (WRCM) was obtained across the three probes. Evidence for the reliability of oral reading probes has been strong, with reliability coefficients consistently above .90 for test-retest, parallel-form, and inter-rater reliability (Marston, 1989).

Reading Fluency. The Reading Fluency subtest of the Woodcock Johnson Tests of Achievement–Third Edition (WJ-III; Woodcock, McGrew, & Mather, 2001) requires examinees to read 98 brief sentences and decide if they are true or false by marking yes or no. The time limit for this task is 3 minutes. The manual reports a high test-retest reliability coefficient of .88, which is based on a sample of individuals across all age groups. Due in part to the newness of this subtest, little research has examined correlates of the Reading Fluency subtest.

Word Attack. The Word Attack subtest of the Woodcock Johnson Tests of Achievement–Revised (WJ-R; Woodcock & Johnson, 1989) requires the examinee to apply phonics skills to pronounce 30 printed nonsense words. This subtest is sensitive to phonological processing abilities such as those found to be deficient in persons with dyslexia (see Blachman, 1997). Internal consistency of this measure is reported as .92, and it has moderate to high correlations with other reading measures.

Procedure

Participants were tested individually in a quiet testing room by graduate and undergraduate students who were trained to 100% accuracy on the protocol. All participants completed the demographic questionnaire, followed by the NDRT and the three oral reading probes. The presentation of the oral reading probes was counterbalanced to minimize order effects. The Reading Fluency and Word Attack tests were then administered, and their presentation was also counterbalanced. The duration of testing was approximately 45 minutes.

RESULTS

Reliability for Oral Reading Fluency Measure

Interscorer agreement. Interscorer agreement was assessed for CBM oral reading fluency by having a second observer simultaneously and independently record data along with the first observer. Reliability data were collected during 30% of sessions. Comparisons among the first and second observers were conducted on a word-by-word basis. A conservative formula, kappa, was used to assess interscorer agreement, which takes into account chance probabilities. Kappa was .93. Percent agreement for words read correctly in one minute was 95%.

Correspondence among oral reading passages. The NDRT passages (i.e., forms E, F, H) were used as probes for oral reading fluency and were subjected to the Dale-Chall (1948) readability index. Results indicated that all passages fell within a range from the 6th- to 8th-grade reading level. The relationship between the three passages was also examined via a correlation matrix. This analysis

indicated a high level of correspondence among the passages (r = 0.84 for forms E and F, r = 0.81 for forms E and H, and r = 0.81 for forms F and H).

Descriptive Statistics

Examination of skewness statistics and normal Q-Q plots for each independent variable was examined. Levene's test was also conducted to examine the homogeneity of variance assumption for median WRCM. Based on these analyses, the data did not deviate from standard statistical assumptions of normality or homogeneity of variance.

A 2 (gender) X 6 (probe order) ANOVA was conducted to examine for gender differences and Oral Reading Fluency probe order effects. There was no statistically significant gender by order interaction, and no main effect for gender or order, with $p > 0.15$. A MANOVA was also conducted to examine gender differences across the reading measures—i.e., Nelson Denny Reading Test Reading Rate (NDRR) scale score, WJ-III Word Attack (WA) and Oral Reading Fluency (RF) scaled scores, and the median Oral Reading Fluency (WRCM). There were no significant gender differences for the reading measures, $F(5, 84) = 1.63$, $p = .16$.

Means and standard deviations for the reading measures are presented in Table 2. The two reading rate measures (i.e., NDRR raw score and the WRCM) yielded different mean reading rates and standard deviations, suggesting a higher estimate of reading fluency by the NDRR, as well as considerable variability in performance. The mean number of words read for the NDRR raw score (M = 230.80, SD = 55.8) was larger than the mean WRCM (M = 189.20, SD = 22.5). Interestingly, the standard deviation of the NDRR raw score was also larger than that of the WRCM.

Table 2
Means and Standard Deviations of Reading Measures

Variable	*M*	*SD*	Norm Percentile
NDRT Reading Rate Raw Score	230.83wpm	55.84	Not normed
NDRT Reading Rate Scale Score	202.44wpm	20.20	47
Med WRCM	189.16wpm	22.50	Not normed
WJ-III RF Scale Score	107.40	12.70	62
WJ-III WA Scale Score	114.58	13.28	75
NDRT Comp SS	230.20	13.70	69

Note.—NDRT = Nelson Denny Reading Test; WJ-III RF and WA = Woodcock Johnson Achievement Test-Third Edition Reading Fluency Subtest and Word Attack Subtest; Med WRCM = median words read correctly in 1 minute; NDRT Comp SS = Nelson Denny Reading Test Comprehension Scale Score; wpm = words per minute.

Examination of percentiles for the standardized reading measures indicates that this sample of college students, presumably above the national median in intelligence and achievement, scored accordingly on the WJ-III Reading Fluency subtest (P = 62), WJ-III Word Attack subtest (P = 75), and the NDRT Comprehension subtest (P = 69). Average performance on the NDRR subtest (P = 47) was not consistent with other reading performances.

A correlation matrix was computed to examine relationships among the var-

ious reading measures (see Table 3). Table 3 illustrates that there are mild to moderate correlations across the reading measures. Of particular interest is that the NDRR subtest only correlates mildly, albeit significantly, with most of the other reading measures, including the NDRT Comprehension subtest (r = .22). By comparison, the WRCM oral reading fluency measure is moderately and significantly correlated to all of the other reading measures and has the strongest relationship with the NDRC (r = .53).

Table 3
Intercorrelations of Reading Test Scores (N = 90)

Measure	NDRT Comp SS	WJ-III RF SS	WJ-III WA SS	WRCM
NDRT RR SS	.22*	.30*	.16	.48**
NDRT Comp SS	-----	.49**	.19	.53**
WJ-III RF SS		-----	.20	.51**
WJ-III WA SS			-----	.47**

Note.—NDRT RR SS = Nelson Denny Reading Test Reading Rate Subtest Scaled Score; NDRT Comp SS = Nelson Denny Reading Test Comprehension Subtest Scaled Score; WJ-III RF SS = Woodcock Johnson Achievement Test- Third Edition Reading Fluency Subtest Scaled Score; WJ-III WA SS = Woodcock Johnson Achievement Test- Third Edition Word Attack Subtest Scaled Score; WRCM = median words read correctly in 1 minute.
*p < .05. **p < .01.

Multiple Regression Analyses

Multiple regression analyses were conducted to determine the variance in average NDRT Comprehension standard score (outcome variable) accounted for by the NDRR, WJ-III RF, WJ-III WA, and WRCM scores (predictor variables). A forward inclusion procedure was followed, and p = .05 was used as the criterion for inclusion in the model. The results of the regression analysis are presented in Table 4. WRCM was entered in the first model (p < .01) and accounted for 28% of the variance (adjusted R^2 = .275) in the NDRT comprehension standard score. The WJ-III RF SS was added to the first model (p < .05), adding another 6% to the variance (combined adjusted R^2 = .335). The second model accounted for 35% of the variance in the NDRT comprehension standard score. The WJ-III WA SS and the NDRT RR SS did not meet the inclusion criteria and were not added to the regression models.

Table 4
Summary of Multiple Regression Analysis for Variable Predicting the Average NDRT Comprehension Score (N = 90)

Variable	B	SE B	ß
Step 1			
WRCM	.33	.06	.53
Step 2			
WRCM	.23	.06	.38
WJ-III RF SS	.32	.11	.30

Note.—R^2 = .283 for Step 1; Δ R^2 = .065 for Step 2 (p < .05).

DISCUSSION

Our first question dealt with how fast college students read standardized reading passages, particularly those on the Nelson Denny Reading Test. The 1-minute silent reading performance on the NDRT Reading Rate test indicated an average rate of 231 wpm with a standard deviation of 56 words. Across three oral reading probes (also NDRT passages), participants averaged approximately 189 wpm with a standard deviation of 23. Not only do these methods arrive at different results, but they also differ in terms of variability. By using three 1-minute probes, oral reading, and subtracting errors, the CBM method appears to reduce the amount of standard error in the assessment of reading speed. The NDRT has been criticized as a crude measure that employs one trial, silent reading, little accuracy, and an imprecise word count without error correction. Perhaps these are reasons why published reliability estimates are low (.62-.82; Rudner, 1991). Also, it is curious that this high-achieving college sample could perform above the 50th percentile on all reading measures except the NDRT Reading Rate. This finding raises even more questions about the accuracy of the Reading Rate subtest as well as the calibration of NDRT norms. It is no wonder that various authors have cautioned clinicians about the use of the Reading Rate subtest (Cummins, 1981; Perkins, 1984).

Intercorrelations among the reading variables provided some evidence of concurrent validity for the Oral Reading Fluency method. WRCM correlated significantly with every measure of reading, regardless of type. The NDRT Reading Rate score, on the other hand, correlated weakly with other measures. Of particular note was that WRCM correlated much more positively with NDRT Comprehension than did NDRT Reading Rate. This finding offers further bad news for the NDRT Reading Rate measure. It is unclear just what the Reading Rate subtest is measuring and how accurate it is measuring reading fluency.

The regression analysis further points out that WRCM significantly predicts NDRT Comprehension, whereas NDRT Reading Rate is not a significant predictor. This is a worrisome finding in that the NDRT is a screening measure used to determine the reading levels and needs of adult students. It would appear that the Reading Rate measure alone would not be a trustworthy measure for making such decisions. Research with children shows that CBM reading fluency measures correlate highly with reading comprehension, perhaps as high as .90 (Shinn, Good, Knutson, & Tilly, 1992). In this study, the NDRT Reading Rate measure was woefully inadequate as a predictor of comprehension. The CBM fluency measure did an adequate job of predicting comprehension, but not nearly as well as it does with children. It is likely that for adults, comprehension is less reliant on reading fluency and more determined by a mixture of factors. For example, reading comprehension in adults may be influenced by their familiarity with the test format, overall verbal/language skills, working memory ability, as well as self-efficacy toward comprehension.

In light of the current findings, several implications may be drawn for clinicians who perform assessments of adults for purposes of test accommodations. First, it seems that expectations of adult reading rate may be a little high, at least when reading rate is assessed using the CBM method. In the literature and in clinical reports we see professionals suggesting reading rates of 300 wpm as typical. Our results are in line with those of Meyer and colleagues (1989, 1999), showing a lower average reading rate even for bright college students. Our CBM method found an average reading rate below 200 wpm. One standard deviation from the mean would result in a band of performance from 166 to 212 wpm. It is likely that silent reading rates would run a little higher than oral reading because every word is not pronounced and errors are not subtracted; however, it is more likely that average silent reading rates for college students are in the low 200s wpm. It would follow that the reading rate for the population in general would be somewhere below that range.

A second implication is that the NDRT Reading Rate measure may be as weak as critics have noted. The test procedure itself lends itself to inaccuracy. Our results suggest that this measure does not correlate strongly with other measures of reading, nor does it predict its own Comprehension measure. One cannot be sure how well NDRT Reading Rate assesses reading fluency, or what a given score would mean clinically. The NDRT was not designed to be an individual diagnostic test, and the results of this study should certainly dissuade clinicians from using the NDRT Reading Rate as a diagnostic measure. It may not even be particularly useful as a screening measure, although that is an empirical question.

It should be noted that a CBM method of reading fluency involves oral reading. This requires the examinee to pronounce each word, which of course limits its reading speed in relation to speaking speed. This may differ from silent reading and speed reading, in which every word is not necessarily read in serial fashion. There appears to be no acceptable measure of speed reading or skimming a passage of text. Because there are many forms of reading (see Carver, 1990), it seems crucial that clinicians assess the same type of reading to determine fluency, and it should be an observable and verifiable form of reading. We recommend that oral reading is the form of reading most conducive to accurate fluency measurement.

Although this is only one study of a convenient sample of college students, the findings do suggest that a CBM measure of reading fluency shows promise for adults. It appears that this type of oral reading rate, at least in this study, has less measurement error and stronger relationships to other reading measures than the method used in the NDRT. Further work should be done to develop a standardized reading rate measure and norm it on a large representative adult population. Ideally, clinical norms could be gathered for adults with learning disabilities and ADHD. Studies could then be conducted to determine whether a measure of reading fluency is valid for predicting reading disorders and determining time accommodations on high-stakes tests.

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