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The Role of Print Exposure in Reading Skills of Postsecondary Students With and Without Reading Disabilities

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Abstract

Exposure to print is a significant predictor of vocabulary growth and declarative knowledge in normally achieving readers (Stanovich, West, & Harrison, 1995). Research has also shown that initial differences in print exposure can be used to predict differences in reading comprehension in children studied ten years after initial assessment (Cunningham & Stanovich, 1997). The present study seeks to broaden this research by using print exposure to explore similarities and differences in both reading comprehension and vocabulary in a sample of students with well-documented learning disabilities in the area of reading (RD), and a control group without reading disabilities. Print exposure was related to untimed reading comprehension scores and vocabulary scores for the students with RD and to timed comprehension scores and vocabulary scores for the control group.

In examining the reading skills of 'atypical' learners, such as those with reading disabilities (RD), it is important to understand the specific similarities and differences these students demonstrate in their reading skills compared to 'typical' readers, and what leads to these differences. More specifically, this

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study was designed to examine the role that print exposure plays in reading comprehension and vocabulary in adults with RD and without RD.

A well-studied factor related to reading acquisition and skilled reading, is phonological awareness (Siegel, 1993; Stanovich & Siegel, 1994; Torgesen, Wagner & Rashotte, 1994). If phonological awareness and subsequent decoding skills are not attained, children often lag behind their peers in terms of their reading development. In atypical learners, specifically those with RD, persistent deficits in phonological awareness have been found to continue into adulthood (e.g., Bruck, 1992; Gottardo, Siegel & Stanovich, 1997; Shafir & Siegel, 1994) despite age-appropriate reading skills (Wilson & Lesaux, 2001).

Struggling students display their deficits by making more reading errors and by reading text at a slower rate. Without fluent decoding, reading for enjoyment is less likely to occur. Therefore, less time is devoted to practicing these reading skills, which could lead to potential improvements in word recognition and reading comprehension skills. This extra practice is important, as the amount of extra-curricular time a child spends reading is often an effective means of differentiating good readers from poor readers (Chard, Vaughn & Tyler, 2002). Extra practice in reading can increase reading fluency and other reading-related skills in children who were average readers (Kemp, Chiappe & Gottardo, submitted).

In addition to fluent decoding, children must have sufficient background knowledge and vocabulary to advance to later stages of reading development (Chall, 1996). Both word reading and listening comprehension skills are crucial for reading comprehension associated with “reading to learn” (Gough & Tunmer, 1986). These comprehension skills often fail to develop until a much later stage in children with reading disabilities due to reduced exposure to a means of acquiring background knowledge and vocabulary, namely exposure to print. Print exposure is one’s general exposure to different literacy materials outside of the classroom. Measures of print exposure serve to assess how much a student reads materials that are not directly related to schoolwork. Through “reading to learn”, vocabulary knowledge is acquired as an informational base that allows readers to further advance their reading development and acquire adequate reading comprehension skills. Vocabulary development has also been found to mediate higher-level comprehension skills such as grammatical knowledge (Chall, 1987). If vocabulary knowledge is sufficiently delayed and the proportion of unknown words in text increases, reading comprehension is disrupted (Carver, 1994). Therefore, vocabulary knowledge has the potential to be both a cause and consequence of the development of reading comprehension (Stanovich, 1992).

In the search for additional variables related to reading in adults with RD, print exposure has the potential to be related to reading comprehension and vocabulary knowledge. The present study examines the role of print exposure in reading among adult readers with RD. Specifically we examine how print exposure is related to reading comprehension in university students with RD, many of whom are able to succeed academically despite their deficient phonological awareness and decoding skills and their potentially lower than average reading comprehension scores. In addition, we examine the relationships between vocabulary and print exposure in the same adults.

One theoretical interpretation used to understand the relationships between print exposure and reading comprehension is the concept of *Matthew effects* in reading (Stanovich, 1986). This theoretical model states that those who are 'rich' in reading skills becomes 'richer', and those who are 'poor' in reading skills become 'poorer'. For example, good readers are more likely to be exposed to print materials and to practice reading skills, which can lead to improved reading skills. In contrast, poor readers are less likely to be exposed to print materials and practice reading skills. In addition, struggling students are more likely to choose materials that are too difficult for them resulting in frustrating and negative experiences with print (e.g., Allington, 1984).

Traditionally, print exposure was assessed using self-report measures of reading behaviour, which were susceptible to confounds of social desirability (Paulhus, 1984). To address this problem and attempt to determine the role of print exposure in reading, Stanovich and West (1989) developed a series of questionnaires that would be used as more valid and reliable measures of exposure to print. The majority of this research, however, has focused on school-aged children who are 'normal' readers. Through a two-year longitudinal study, the authors used the Title Recognition Test (TRT; Stanovich & West, 1989) and the Author Recognition Test (ART; Stanovich & West, 1989) on a sample of fourth-, fifth-, and sixth-grade children to determine their relationship to several measures of literacy. The authors found that these two measures of print exposure predicted growth in receptive vocabulary, general information, spelling, sight vocabulary, verbal fluency and reading comprehension (Echols, West, Stanovich & Zehr, 1996).

In a ten-year longitudinal study conducted with a group beginning in first grade, reading ability measured at time one predicted a significant amount of variance in eleventh grade print exposure (Cunningham & Stanovich, 1997). This suggests that students' early acquisition of reading, regardless of their ability in eleventh grade, predicts that they will be more likely to be engaged in reading activity in the later grades. Other important findings were that current

levels of print exposure in eleventh grade accounted for a significant amount of variance in comprehension and vocabulary skills.

Similar results have been repeated for college samples (Stanovich & Cunningham, 1993; Stanovich, West, & Harrison, 1995). Specifically, print exposure was found to be a significant contributor to the acquisition of content knowledge, even after measures such as general cognitive ability, reading comprehension and high school grade point average had been controlled (Stanovich & Cunningham, 1993). In comparing knowledge between college students (mean age = 19 years) and seniors (mean age = 79 years), researchers once again placed importance on the unique contribution of print exposure in predicting vocabulary and declarative knowledge (Stanovich, West, & Harrison, 1995). Although the readers in these studies were normally achieving, these findings support the unique contribution print exposure has to knowledge acquisition beyond highly related cognitive abilities such as general ability and working memory.

The relationship between print exposure and various reading skills in normal learners raises the question regarding what occurs in atypical learners. There have been few studies as to how print exposure may be related to literacy skills in these populations. McBride-Chang, Manis, Seidenberg, Custodio, and Doi (1993) compared RD ($N=36$) and non-RD ($N=49$) students in grades 5-9. Print exposure, as measured by title recognition, was a significant predictor of reading comprehension for the RD group after word identification, vocabulary and metacognition were controlled. For non-disabled readers, title recognition was also significantly related to reading comprehension but did not remain significant once other predictors such as higher-level cognitive processes were taken into account. The researchers suggested that because disabled readers tend to read less, partly because of insufficient decoding and fluency skills, the lack of exposure to print may cause further cognitive deficits. They further explained their findings through the framework of Matthew effects in reading. However, these findings must be interpreted with some caution, as the selection of the nondisabled group of readers was less stringent than the selection of the group of disabled readers. Children selected for the RD sample scored at the 25th percentile or below on the Woodcock Reading Mastery Test, and exhibited a discrepancy between IQ and reading achievement. However, students without RD scored above the 25th percentile on the same battery of tests used for selection (range = 28.0% to 97.0%), resulting in a group of both highly skilled and lower skilled readers.

A behavior that could be related to general knowledge and is likely negatively related to print exposure is television viewing. Stanovich and

Cunningham (1993) found that although print exposure is related to increases in general knowledge, television viewing is not. In contrast, Hall, Chiarello and Edmondson (1996) found that whereas general ability accounted for a significant amount of variance in general knowledge, television preference accounted for an additional 20% of unique variance in general knowledge (Hall et al., 1996). Specifically, educational television may increase literacy, whereas, non-educational television may limit literacy (Hall et al., 1996). This pattern has also been found in other studies looking at the role of educational versus non-educational television and its relation to reading related skills (Uchikoshi, 2006). Therefore, an Activity Preference Questionnaire was used in the current study to evaluate the participant's preferences for watching television or reading. This measure could provide an additional glimpse into behaviours related to vocabulary development that are likely not related or are negatively related to print exposure.

While little research has been conducted relating print exposure to reading in children who have a RD, even less has been conducted with adults with RD. Specifically, examining print exposure in sample of postsecondary students with RD will provide us with insight into the relationships between measures of exposure to print, reading comprehension and vocabulary in a relatively successful group of young adults with RD.

Postsecondary students with RD typically have delays in many reading skill areas, and it is unknown which areas influence or relate to print exposure. In addition, limited research exists as to whether postsecondary students who continue to show phonological awareness deficits, despite having age-appropriate reading skills, show differences in their exposure to print as compared to a non-RD control group. Many post-secondary students with RD, specifically university students, have successfully or partially compensated for deficits in word reading (e.g., Fink, 1998; Parrila, Georgiou & Corkett, this issue). However, it is not clear whether or not this is a select subset of adults with RD who read more, or if they have developed other compensatory mechanisms aside from reading to mediate their age-appropriate reading performance. The present study examines the relationship between print exposure and reading in university students with RD and a group of peers without RD. The present study also investigates how the performance of these young adults compares to previous research (McBride-Chang et al., 1993; Stanovich & Cunningham, 1993).

Method

Participants

Thirty students participated in the current study. Thirteen of these students (6 women and 7 men, mean age = 21.9 years) were diagnosed with a reading disability as supported by a full psycho-educational assessment by a registered psychologist. The majority of these students were diagnosed primarily on the basis of a discrepancy between reading ability and general intelligence. The students included in the present sample exhibited deficits in decoding, phonological awareness or reading comprehension at the time of diagnosis. All of the students, including those with reading disabilities were recruited from a small undergraduate liberal-arts university. These participants were compensated \$10 for participation in the study.

Seventeen control group participants (13 women and 4 men, mean age = 18.3 years) were recruited from an introductory psychology class and received research participation credits for their participation in the study. The control group participants were selected based on the following criteria: no history of resource remediation or tutoring, self-report as an average reader and learner, having English as a first language, and not being on medications at the time of the study. Participants were informed that their completion of the study was voluntary and were also informed that they could end their participation in the study at any time.

Materials

Nelson-Denny Reading Test (Brown, Fishco, & Hanna, 1993). Reading skills were assessed using forms G and H of the Nelson Denny reading comprehension test, each form being alternated between participants. Both forms (G & H) of the Nelson Denny reading comprehension test were employed under timed and untimed conditions. Therefore, each participant was tested using both forms of the comprehension test, one form being timed at 20 minutes and the other form having an unlimited time to complete. For the untimed version, the question that the participants were on at 20 minutes, 30 minutes, and 40 minutes was noted. Norms are provided in the manual for both timed and untimed administration of the reading comprehension test. Students were required to read a series of passages and answer multiple-choice questions related to the content of the preceding passage. In total, there were seven passages and 38 multiple choice questions. As well, the vocabulary subtest (Form G) of the Nelson Denny was used. This test involved a series of 80 incomplete sentences whereby the student was to choose among five

alternatives for the word that best completed the sentence. Students were given a total of 15 minutes to complete this subtest of the Nelson Denny (Brown et al., 1993).

Author Recognition Test (ART; Stanovich & West, 1989 revised by Martin-Chang, Gould, & Meuse, 2007). This test involves reading a list of both real popular authors and names of people who are not popular authors, the latter acting as foils to detect guessing. Each participant was required to check off the names of those authors that they recognized to be real authors. Two different versions of the ART were used during testing. Eleven participants were tested using a less extensive version of the ART (8 controls, and 3 RD). Subsequently, the task was changed to a more comprehensive version. The shorter version involved a series of 45 authors, identical to those developed by Stanovich and West (1989); whereas the longer version involved a series of 75 authors and 75 foils. This version of the test contained all of the original items, plus an additional 30 items. This revised questionnaire was developed in conjunction with the present study, and looked at the types of print experiences that students had along with their actual recognition of names of authors and magazines. However, this data was not used in the present study.

In order to be able to compare performance on different versions of the test, raw scores on the versions of the ART were converted to z-scores to control for the different standard deviations on the two versions of the test.

Magazine Recognition Test (MRT; Stanovich & West, 1989 revised by Martin-Chang et al., 2007). The MRT was designed to test a different type of out of school reading, containing a wide variety of genres from scientific reviews to more popular teenage publications. The MRT was also changed midway through testing, so that the same participants who completed the shorter ART, completed the original, shorter MRT. This test involved the addition of both foils and real magazines, resulting in a total of 75 magazines and 75 foils, analogous to the number in the revised version of the ART.

In order to have a more diverse measure of exposure to print, scores from the ART and the MRT were combined as was previously done by Cunningham and Stanovich (1997) to balance out exposure to different types of print material. This combined score involved averaging the two z-scores for each participant obtained through the ART and MRT tests.

Activity Preference Questionnaire (APQ; Stanovich & West, 1989). This questionnaire was used to measure preference for reading and preference for watching television in relation to other activities. It involved a series of 12

questions, 5 of which focused on reading, and 4 of which focused on watching television. Questions were in the following format: "I would rather (a) listen to music of my choice, or (b) watch a television program of my choice." Or, to determine if one had a preference for reading, questions would read as follows: "I would rather: (a) read a book of my choice, or (b) play an outdoor sport of my choice. One of the remaining questions was a forced choice between a preference for reading or watching television, whereby, this question was counted in either category depending upon the participant's choice of activity.

The remaining two questions dealt with optional choices of activities such as listening to music or talking with friends, and did not offer options dealing with watching television or reading a book. These questions were designed in the original questionnaire to serve as distractor questions as to not give away the purpose of the questionnaire in its entirety.

Procedure

Each participant was tested individually in a testing session lasting approximately 1 ½ hours. The timed Nelson Denny reading comprehension test was carried out, taking a total of 20 minutes, followed by the Nelson Denny Vocabulary Test, for which students were allotted 15 minutes to complete as many questions as possible. Participants then completed the alternate version of the Nelson Denny reading comprehension, for which they had an unlimited time to complete. This was followed by completing the ART, the MRT, and the APQ.

Results

Means were compared for the two groups, the RD versus non-RD control group. Correlations and regressions were calculated for each group separately to determine relations among print exposure, vocabulary and reading comprehension. The small sample sizes require that the results be interpreted with caution.

The means and standard deviations of the RD group and the control group on each variable measured in the current study are presented in Table 1. The groups differed in age with the RD sample being significantly older, $t(27) = 6.45, p < .001$. In comparing the two groups on the Nelson-Denny reading comprehension and vocabulary tests, there was no significant difference between the two groups. However, the control group did score higher on these

measures. In addition, the effect sizes were in the medium range, suggesting differences could be found with a larger sample. No significant differences were found between the two groups for scores on the MRT and ART. The control group showed a slightly higher preference for watching television in comparison to the group with RD.

Intercorrelations among all variables of reading skills and print exposure are shown in Table 2. For the RD group, significant correlations were found between vocabulary and the timed comprehension test, $r = .58$, and between vocabulary and the untimed comprehension test, $r = .73$. There was also a significant correlation between the ARTMRTZ score and vocabulary, $r = .72$. Also, the ART score was significantly negatively correlated with the TV watching component of the APQ in the RD group, $r = -.66$. No positive relationships were found between the APQ and other variables for the group with RD. The MRT was correlated with reading comprehension and vocabulary, $r_s > .66$.

The control group, however, did not produce the same pattern of results. The control group only showed a significant correlation between the timed Nelson Denny comprehension test and vocabulary, $r = .52$, but not between the untimed comprehension test and vocabulary. Another relationship that appeared differently was that the control group showed a significant positive correlation between the ART and the vocabulary score, $r = .70$. The combined ARTMRTZ score was found to show a significant correlation with vocabulary, $r = .60$, similar to the RD group. There was also a significant positive correlation between the ARTMRTZ and the APQ measure of reading, $r = .63$, and between the APQ measure of reading and vocabulary, $r = .54$ in the control group.

Separate multiple regressions for each group were run, in order to examine the differences between the two groups, in terms of which measures were and were not significantly related to reading comprehension (Tables 3 & 4). A model that included vocabulary and the combined ARTMRTZ score as the independent variables predicted untimed reading comprehension in the RD group, $F(2, 10) = 6.20$, $p = .018$, $R^2 = .55$, adjusted $R^2 = .46$. None of the variables were related to untimed comprehension in the control group, so this analysis is not reported.

Alternate models with timed reading comprehension were tested for the RD and control groups (Table 4). Vocabulary was related to the timed reading comprehension score in the control group, $F(1, 15) = 5.57$, $p = .032$, $R^2 = .27$, adjusted $R^2 = .22$, as was the combined print exposure measure, $F(1, 15) = 5.40$,

Table 1
Descriptive Statistics of Variables for the RD Group and the Control Group

	Group	N	Mean	Standard Deviation	Min	Max	T-test (t)	Effect size (Cohen's d)
Age (years)	RD	12	21.33	1.78	18	24	6.45***	1.51
	Control	17	18.29	0.69	17	20		
Std. Comp (Timed)	RD	13	201.46	25.34	150	232	-1.77	0.64
	Control	17	215.65	18.57	188	250		
Std. Comp (Untimed)	RD	13	226.00	18.98	188	250	-1.84	0.66
	Control	17	236.00	9.77	215	248		
Std. Vocab	RD	13	224.92	19.38	180	257	-0.64	0.23
	Control	17	229.24	17.19	204	255		
APQ (reading)	RD	13	1.54	1.27	0	5	-0.20	0.08
	Control	17	1.65	1.58	0	5		
APQ (TV)	RD	13	0.54	0.52	0	1	-1.66	0.64
	Control	17	1.12	1.17	0	4		
ART (z score)	RD	13	.0630	.857	-1.31	1.03	.302	0.11
	Control	17	-.0482	1.09	-1.74	2.07		
MRT (z score)	RD	13	.1374	1.15	-2.08	1.72	.663	0.24
	Control	17	-.1051	.846	-2.30	1.24		
ARTMRTZ (averaged z)	RD	13	.100	.846	-1.15	1.11	.301	0.22
	Control	17	-.077	.761	-1.27	.92		

***Significant at the 0.001 level (two-tailed)

Table 2
Intercorrelations Among Variables for Participants with RD below the Diagonal, and
Control Group Participants above the Diagonal

Variable	1	2	3	4	5	6	7	8
1. Std. Comp (Timed)	—	.14	.52*	.38	-.13	.31	.52*	.51*
2. Std. Comp (Untimed)	.59*	—	.50	-.06	-.06	.42	.26	.45
3. Std. Vocab	.58*	.73**	—	.54*	-.00	.70*	.18	.60*
4. APQ (Reading)	.22	.25	.52	—	-.08	.72**	.20	.63**
5. APQ (TV)	.03	-.03	-.30	-.10	—	.15	.32	.28
6. ART (z)	-.01	.32	.51	.14	-.66*	—	.22	.84**
7. MRT (z)	.70**	.66*	.67*	.17	-.21	.40	—	.71**
8. ARTMRT (z)	.47	.61*	.72*	.19	-.48	.78**	.89**	—

*Correlation is significant at the 0.05 level (two-tailed)

**Correlation is significant at the 0.01 level (two-tailed)

Note. Std. Comp = Standardized comprehension scores from the Nelson-Denny Reading Test; Std. Vocab = Standardized vocabulary scores from the Nelson-Denny Vocabulary Test.

Table 3
Multiple Regression Analyses Predicting Untimed Reading
Comprehension for Participants with RD

Independent Variables (predictors)	R^2	Adj. R^2	Beta weights	t -value	p -value
1. ARTMRTZ	.372*	.315	.610	2.55	.027
1. Vocabulary	.539*	.497	.734	3.59	.004
1. Vocabulary	.554*	.464	.611	2.02	.071
2. ARTMRTZ			.171	.565	.585

* $p < .05$

$p = .035$, $R^2 = .27$, adjusted $R^2 = .22$. When the two factors were combined into one model, the model was no longer significant. Only vocabulary was related to timed reading comprehension in the RD group, $F(1, 11) = 5.67$, $p = .036$, $R^2 = .34$, adjusted $R^2 = .28$. For both groups vocabulary was related to timed reading comprehension, however, only the RD showed different and significant models for untimed and timed comprehension. These findings are relevant to the use of extra time to complete tests as an accommodation for students with RD, which will be discussed later.

To fully understand the nature of the correlations and to determine what skills are related to the vocabulary acquisition of these individuals, we analyzed predictors of vocabulary through a series of multiple regression analyses (Table 5). In predicting vocabulary in the RD group, the combined ARTMRTZ score served as a highly significant predictor, $F(1, 11) = 11.67$, $p = .006$, $R^2 = .52$, adjusted $R^2 = .47$. Additionally, a model that included the ARTMRTZ and the APQ score for reading served as a significant predictor of vocabulary, $F(2, 10) = 10.02$, $p = .004$, $R^2 = .67$, adjusted $R^2 = .60$. In the control group, the same regressions were analyzed in order to compare the extent to which these factors accounted for variance in vocabulary. A model using the ARTMRTZ as an independent variable accounted for a significant amount of variance in vocabulary, although less variance was accounted for in the control group as compared to the RD group, $F(1, 15) = 8.55$, $p = .010$, $R^2 = .36$, adjusted $R^2 = .32$. As you can see, the print exposure variable on its own accounts for a higher percentage of

Table 4
Multiple Regression Analyses Predicting Timed Reading Comprehension

Independent Variables (predictors)	<i>R</i> ²	Adj. <i>R</i> ²	Beta weights	<i>t</i> -value	<i>p</i> -value
Control Group					
1. ARTMRTZ	.265*	.216	.514	2.32	.035
1. Vocabulary	.271*	.222	.520	2.36	.032
1. Vocabulary	.334	.239	.330	1.21	.247
2. ARTMRTZ			.315	1.15	.268
RD Group					
1. ARTMRTZ	.224	.153	.473	1.78	.103
1. Vocabulary	.340*	.280	.583	2.38	.036
1. Vocabulary	.346	.215	.502	1.37	.201
2. ARTMRTZ			.113	0.31	.765

* *p* < .05

** *p* < .01

variance in vocabulary in the RD group than that accounted for in the control group. Additionally, a preference for reading over other activities adds more unique variance in vocabulary in the RD group than in the control group. Therefore, both ARTMRTZ and the activity preference questionnaire are related to vocabulary knowledge in both groups.

Discussion

The purpose of the present study was to investigate differences that may exist between a control group of students without any documented problems in reading, and a group of students with documented RD. The small sample size requires that caution be used to interpret the findings. However, to our knowledge, no research has been conducted specifically examining the

Table 5
Multiple Regression Analyses Predicting Vocabulary

Independent Variables (predictors)	R^2	Adj. R^2	Beta weights	t -value	p-value
Control Group					
1. ARTMRTZ	.363**	.321	.602	2.92	.010
1. ARTMRTZ	.406*	.321	.435	1.65	.122
2. APQ (reading)			.267	1.01	.330
RD Group					
1. ARTMRTZ	.515**	.471	.717	3.42	.006
1. ARTMRTZ	.667**	.601	.643	3.46	.006
2. APQ(reading)			.398	2.14	.058

* $p < .05$

** $p < .01$

relations between print exposure, vocabulary and reading comprehension in adults with RD.

From the analysis of results, we can see that there were no significant differences between the groups of students with RD and without RD on measures of timed or untimed reading comprehension. However, the effect sizes suggest that differences might exist between the groups. Additionally, no significant differences could be found in vocabulary, or between the two groups in terms of scores on the measures of print exposure with smaller effect sizes. The question of whether or not these differences would appear in a larger group of students is unknown due to the unique nature of the RD group in the present sample. With a larger sample, there would most likely be more variability in this group of students, but additional data may also allow a sample with more variability to be broken into a group of students who have partially compensated for their RD, such as we are suggesting in the present sample, and those who have not compensated for their reading difficulties (Parrila, Georgiou & Corkett, this issue). By virtue of being university students, these participants are likely to

have partially compensated for their reading difficulties, in contrast to individuals with reading disabilities who do not pursue post-secondary education.

From these results, it seems that this group of postsecondary students with RD has at least partially compensated for their decoding problems in order to attain scores comparable to a nondisabled group on reading comprehension. In addition, nonsignificant differences were found in print exposure suggesting that this group of post-secondary students with RD is familiar with texts usually read outside of the classroom at a level comparable to a control group of peers without RD. It is likely that this sample is a select subgroup of adults with RD who tend to read more than what is typically expected from disabled readers. As the literature regarding print exposure suggests, increased practice in reading is related to better reading skills (Cunningham & Stanovich, 1997), although the direction of causality is not clear. Causal relations cannot be directly inferred from our data due to its concurrent nature and the difficulty in determining the initial causal links among print exposure, vocabulary and reading comprehension. Further longitudinal studies including print exposure, reading and vocabulary in students with RD could provide some insight into causal relationships among these variables.

Even though there were no significant differences between the groups in several variables, interesting relationships emerged in comparing the relations among variables in the two groups. Students with RD are assumed to rely less on print as a means of knowledge acquisition due to their difficulty in attaining adequate word reading and reading comprehension skills. However, in our sample, print exposure was related to vocabulary in both groups of students. This relationship suggests that extracurricular reading might play a more important role in vocabulary acquisition in students with reading disabilities than previously believed, or might serve as a mediator in attaining vocabulary skills. Also, adding the score about reported preference for reading to the model increases the amount of variance accounted for in vocabulary. In the control group, reported preference for reading was significantly related to vocabulary knowledge. However, this model explained less variance than for the RD group.

An interesting difference between the groups exists in terms of their answers regarding a reported preference for reading and variables considered related to reading behaviour. For the control group, reported preference for reading was related to print exposure. In contrast, reported preference for reading was not related to print exposure in the RD group, but preference for television watching was negatively related to reading. It is possible that "reading for pleasure" is not the same thing in the two groups and television watching is an alternative to reading in the RD group.

Finally, an interesting comparison between the two groups includes the variables related to timed and untimed reading comprehension scores, specifically the combined print exposure measure. In the RD group, relationships were found between untimed reading comprehension and print exposure and vocabulary. None of the variables measured were related to untimed reading comprehension in the control group. A different relationship emerges for the control group with the timed comprehension score, being significantly related to print exposure, as was found for the untimed reading comprehension in the RD group. This finding reinforces the importance of understanding the necessity of extended-time administration of tests for those with RD, as it takes these students more time to process text and obtain meaning from it (Lesaux, Pearson, & Siegel, 2006). It also suggests that receiving unlimited time to complete a reading comprehension measure is not related to variables known to predict reading comprehension in the control group of non-disabled readers.

In reference to how these findings relate to those obtained by Cunningham and Stanovich (1993), the results can be compared to our control group. In the present sample, the print exposure measure accounted for a similar amount of variance in vocabulary and reading comprehension in the control group as in previous data (Cunningham & Stanovich, 1993). For the RD group, relationships were found between print exposure and untimed reading comprehension in the group of students with RD, and reflect the findings by McBride-Chang et al. (1993) that the title recognition test predicted more unique variance in the reading comprehension abilities of younger students with RD. Our findings also expand upon previous research by showing that print exposure is related vocabulary knowledge in the RD group, similar to the control group.

Given the relationships that have emerged between the RD group and the control group, it is important to consider print exposure as a potentially valid and valuable construct in examining the reading behaviour of students with RD. Even students with RD might be reading beyond what is minimally expected. In this particular sample, print exposure is related to vocabulary development and some measures of reading comprehension in students with RD. This research also draws on the importance of self-directed reading, which has been found to be a significant contributor to individual success in literacy for adults with RD (Fink, 1998). In relation to the concept of Matthew effects, the data suggest that not only is initial reading ability important in enhancing reading skills, but subsequent reading behaviour might be related to reading and reading-related skills. Although usually the “rich get richer”, increased practice in reading might lead to better reading and reading-related skills in initially poor readers, helping “poor” readers become “richer”.

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