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THE EFFECT OF PRINT ACCESS ON READING FREQUENCY

JEFF MCQUILLAN
California State University–Fullerton, Fullerton, California, USA

JULIE AU
University of Southern California, Los Angeles, California, USA

Studies on reading motivation have found that access to reading materials has an important influence on the amount students choose to read. There are few studies, however, that have examined print access in a comprehensive way to include home, school, and community resources. In this study, surveys and reading tests were administered to a class of eleventh-grade students (N = 24). Consistent with previous research, convenient access to reading material, regardless of a student's reading ability, was associated with more frequent reading. In addition, more voluntary or "free" reading was associated with higher levels of reading proficiency. Implications for providing students with easier access to reading materials are discussed.

An important variable in explaining differences among students in reading proficiency is the amount of reading done both in and out of school (Anderson, Wilson, & Fielding, 1988). Theorists from a variety of perspectives on reading acquisition agree that voluminous reading improves reading skills (Goodman, 1996; Smith, 1994; Stanovich, 1994). This finding is widely known in the research field and among practitioners in classrooms. Less known, however, is the growing body of evidence pointing to a connection between easy access to reading material and the amount of reading in which students engage (Elley, 1991; Krashen, 1993, 1995; Lance, Welborn, & Hamilton-Pennell, 1993; McQuillan, 1998a; Rucker, 1982; Worthy, 1996; Worthy, Moorman, & Turner, 1999). Increased access to reading materials may have an independent, causal role in increasing student's motivation to engage in reading activities.

Address correspondence to Jeff McQuillan, School of Education, CSU–Fullerton, P.O. Box 6868, Fullerton, CA 92834. E-mail: jmcquillan@fullerton.edu

Despite these suggestive pieces of evidence that home, school, and community environments can individually contribute to literacy development, there have been few comprehensive analyses of all of the possible sources of reading materials and how these sources of access relate to the frequency of free reading, controlling for the mediating effects of reading ability. This dearth of research is particularly evident at the secondary level, where, with a few exceptions, most studies to date have focused on reading that takes place in school, rather than students' pleasure reading activities. This exploratory study attempts to examine these variables with a group of English-speaking adolescents in a U.S. high school.

Background

While theoretical perspectives in reading have ranged from "internal" cognitive processes (Stanovich, 1994) to sociocultural and political frameworks (Shannon, 1992), there have been few attempts to understand how reading behavior is affected by the *physical environment* that surrounds the reader. This is not a situation unique to literacy research, however. The "ecology" of learning, the physical and material aspects associated with achievement in educational settings, has generally received little attention in studies on school and classroom climates, which have instead focused mostly on individual or interpersonal issues (Anderson, 1982; Chavez, 1984).

One problem in the analysis of ecological variables in education is the lack of a strong theoretical basis for understanding *how* physical environments affect learning. One straightforward and appealing solution is to posit that placing oneself in certain environments has an effect on one's interest and motivation in engaging in an activity. Schiefele (1991) distinguishes between two types of interest—situational and personal. Situational interest deals with how environments can increase or decrease one's interest in an activity, whereas individual interest is based on one's inclination to perform an action as well as one's realization of that interest through the actual engagement in the activity. As Worthy et al. (1999) have suggested, it appears likely that certain environments can create or promote a situational interest that, in turn, can lead to "actualized" interest in voluntary activities such as reading. Physical environments can both promote situational interest as well as

provide the means for which one can realize one's (potential) individual interest in reading.

Interest can also influence one's motivation to act (Schiefele, 1991). Several theorists have noted that motivation is critical in determining the course of action one takes in a given environment (Csikszentmihalyi, 1990; Deci & Ryan, 1992). Deci and Ryan (1992) observed that humans have "innate…needs for competence and self-determination" which serve to initiate behavior (p. 32). This internal or "intrinsic" form of motivation consists of both one's sense of volition in engaging in a task, as well as one's perceived competence to perform it. The greater the competence to perform a task, the more likely one is to engage in it. Csikszentmihalyi (1990) similarly attributes engagement and increased skill in an activity to one's sense of "internal" motivation, a drive to participate in an activity due to the enjoyment one receives from it (called "flow" or "optimal experience"). Studies of adolescent and adult readers has confirmed that such "optimal experiences" are present in reading (McQuillan & Conde, 1996; Nell, 1988). In both Deci and Ryan's and Csikszentmihalyi's conceptualizations of motivation, it is clear that motivation is central in understanding action.

Linking interest and motivation thus provides a theoretically persuasive framework for the connection between physical environments and actions: environments can create situational interest, which in turn leads to greater individual motivation, and ultimately to greater participation in an activity. It is from this vantage point that we can briefly review the literature on access to reading materials (environment) and reading frequency (activity). Further, it is useful to discuss the importance of reading frequency on growth in reading proficiency, since it is ultimately the variance in reading abilities among students of different environments that the current study hopes to explore.

Access to Reading Materials and Reading Frequency

While most researchers and practitioners are aware of the research connecting reading frequency and proficiency, there has been less discussion in the literature concerning the growing body of evidence linking access to reading materials and amount of reading done. This evidence indicates that the presence of more reading materials in the classroom and in school is associated with greater

reading frequency and achievement, controlling for socioeconomic confounds (Elley, 1992; Krashen, 1995; Lance et al., 1993; McQuillan, 1996, 1998a). Halle, Kurtz-Costes, and Mahoney's (1997) longitudinal study of 41 third-grade children attending inner-city schools, for example, found that the number of books in the home predicted reading achievement, even when controlling for the mother's level of education and the child's previous reading ability. Access to books had a unique effect on reading achievement.

Morrow (1992) also provides strong evidence of the influence of physical access in the immediate environment in her experimental study involving second-grade classrooms. She found that increasing the access to books for children via the expansion or addition of classroom literacy centers (libraries) and teacher-guided literature activities led to more reading by the experimental groups and higher levels of reading achievement. Students who had increased library access reported dramatic increases in the number of books and magazines they read; control-group students of similar socioeconomic levels showed virtually no increases. Neuman and Roskos (1993) observed similar effects in an experimental study of preschool-age children. Students randomly assigned to "print-rich" play were able to acquire certain features of print awareness better than those who were not exposed to such an enriched environment.

While access to print may, as hypothesized above, lead to increased motivation to read and reading frequency, it may also be that other literacy activities associated with greater print access are responsible for observed effects of increased reading (e.g., shared book reading, role models of adults reading, parents and teachers valuing literacy) (Baker, 1999). The available evidence suggests, however, that physical access to print alone can have an impact on reading achievement. Neuman and Roskos (1993) found that while parental interaction with preschool children combined with a print-rich environment produced the strongest effects on literacy development, print access alone had a powerful impact on the growth in children's knowledge of literate behaviors. Rucker (1982) also concluded that simply providing students with more physical access to print led to greater reading proficiency. Rucker gave a random sample of junior high school students two free magazine subscriptions related to their interests for a period of one year.

Students receiving the magazines scored significantly higher at the end of the experiment than did a control group who received no free magazines. More access to print lead to more reading and higher reading achievement.[1]

Reading Frequency and Reading Ability

Several researchers have found a strong connection between the amount of reading done by students and their level of reading proficiency. Anderson et al. (1988) studied the leisure time activities of a group of fifth-grade students over a period of several weeks. The self-reported range of time and amount of reading among students varied widely, from an hour and a half to less than 2 minutes per day, and from around 50,000 to close to 5,000,000 words read per year. To determine the extent to which the amount of free reading was associated with growth in reading achievement, Anderson and his colleagues partialled out the effects of the students' previous test scores (from grade 2). The result was a positive correlation between reading achievement for book reading (.29) and comic book reading (.19). Taylor, Frye, and Maruyama (1990) also found in their study using reading logs that the time spent in silent reading in school was a significant predictor of growth in reading comprehension among fifth and sixth graders, after having controlled for previous reading ability.

Alternative measures of reading frequency or "print exposure" have reached similar conclusions regarding the link between amount of reading and reading achievement. A series of studies have measured reading frequency through "recognition checklists," where the study participant indicates whether he or she is familiar with certain book titles and author names. Real items are mixed in with false ones to correct for guessing. The idea is that those who recognize more authors or titles have, in fact, read more (West, Stanovich, & Mitchell, 1993). Moderate to strong positive correlations between these measures of print exposure and literacy indicators have been found at all age levels, and to be true across

1. The definition of "access" could be expanded, of course, to include not only the physical aspect of print availability but those activities which increase one's use of print—reading aloud to children, talking about books, etc. From a policy point of view, one would clearly wish to provide not only more reading material but also activities supportive of its use.

languages (Cipielewski & Stanovich, 1992; Lee & Krashen, 1996). This relationship between reading frequency and reading ability appears to be true even holding constant years of education for adults (Stanovich, West, & Harrison, 1995), and controlling for the parental level of education for children (Ortiz, 1986).

Experimental research has confirmed the causal role of reading frequency on proficiency suggested by simple and cross-lagged correlational evidence. Krashen's (1993) review of 41 studies on "sustained silent reading" (SSR) programs, where students are given a certain amount of time each day (usually 10–20 minutes) to read a book for pleasure, found that SSR students do as well as, and usually better than, those with less print exposure on measures of reading comprehension and vocabulary knowledge. When in place for a sufficient length of time (about 1 school year), SSR programs produce consistently superior results. These results have been replicated with second-language learners as well (Elley, 1991, 1998; McQuillan, 1996, 1998b).

Despite the suggestive evidence linking access to reading materials with amount of voluntary reading done and, subsequently, reading ability, several important questions remain. There has, for example, been no comprehensive study of the amount of student access to reading materials from all three possible sources available to them—home, school, and community. Previous studies have looked only at one or two possible sources of print access, or have measured access in limited ways. Little is known, for example, about the relative importance of home versus school access in promoting greater reading frequency, or the extent to which age mediates the importance of these various sources. In addition, there is little research on how the amount of free reading done is related to "involuntary" access to print; that is, access to print over which students have little or no control, such as the distance to or convenience of their public and school libraries. Similarly, there has been no investigation into the influence that access to reading materials has on frequency of free reading independent of reading ability. While we can expect better readers to read more, it is still unclear if greater access to print benefits students irrespective of their reading level.

This study seeks to provide a more comprehensive measure of access and explore the relationships among access, reading fre-

quency, and reading comprehension for a group of adolescent students. Specifically, the research questions addressed are:

1. How much access do high school students have to interesting reading materials in the home, at school, and in the community?
2. What is the relationship between reading frequency and reading comprehension?
3. What is the relationship between access to reading materials and reading frequency, controlling for reading ability?

Method

A group of high school students from a middle- and working-class community in southern California participated in the study. Students (N = 24; 10 males, 14 females) in the school were in a regular junior English/language arts classroom (mean age: 17.5 years), representing neither the school's best (honors) nor worst (remedial) readers. The parental level of education of the students varied from less than high school to post-graduate studies, with average being some college or vocational training. Previous standardized test score data and teacher assessments indicated that these students had scored at grade level in reading comprehension. Participantss were administered the surveys and tests over a two day period after obtaining parental consent and student assent for participation. The instruments used were (a) a biographical survey, (b) print access and reading habits survey, (c) a reading comprehension subtest, and (d) several print exposure measures.

Biographical Survey

Questions were asked regarding age and gender. The highest level of education attained by the participant's mother and father was obtained via multiple-choice questions about each parent, using the following scale: 1 = less than high school, 2 = graduated high school, 3 = attended some college or vocational school, but did not graduate, 4 = graduated from college, 5 = graduated from Masters or Doctoral program. The highest score recorded for one or both parents was used in the analysis.

Print Access and Reading Habits Survey

HOME

Participants were asked multiple-choice questions on the number of books in their home and the number of these that they have actually read or found interesting to read. The five possible responses to these questions were identical to those used in the International Association for the Evaluation of Educational Achievement's (IEA) recent comparison of reading in 32 countries (Purves & Elley, 1994). The IEA study was a large-scale survey of reading habits and proficiency of over 200,000 nine- and fourteen-year-olds in 31 countries. The wording of the IEA questions and recoding procedures underwent piloting testing and rigorous tests for validity and reliability for a similar age group, and it was thus decided to use the IEA questions in the present study whenever possible. The answers were then recoded, as was done in the IEA study, to the following values: 0–10 (recoded 5), 11–50 (recoded 30), 51–100 (recoded 75), 101–200 (recoded 150), and More than 200 (recoded 250). Paricipants were also asked how many books they personally owned that they have read or plan to read for pleasure. Since the range was thought to be less, the ranges used here were correspondingly reduced and recoded at approximately midrange: 0, 1–5 (recoded 3), 6–10 (recoded 7), 11–25 (recoded 18), 26–50 (recoded 38), and Over 50 (recoded 75). Students were also asked to indicate any magazines or newspapers received at home. The number of periodicals written down was recorded following Stanovich and West (1989). Finally, participants were asked how many books they bought to read for pleasure in the past month, with the following response options: 0, 1–3 (recoded 2), 4–6 (recoded 5), 7–10 (recoded 9), and 11 or more (recoded 15).

COMMUNITY

Participants were asked how many times they visited their public library in the past month (0, 1–3 [recoded 2], 3–4 [recoded 4], 5–6 [recoded 6], or Over 6 [recoded 8]), how they normally traveled to the library (walking, by bus, by car, or biking), and how long it took to get there (less than 5 minutes [recoded 3], 6–10 minutes [recoded 7], 11–15 [recoded 13], 16–30 [recoded 23], or more than 30 minutes [recoded 35]). While other sources of reading material are available to students, previous research (see

Krashen, 1993) has indicated that libraries serve as one of the primary resources for most young readers.

SCHOOL

Participants were also asked multiple-choice questions on how frequently they visited their school library in the past month, and how often they were taken to the school library by their teachers during this same time period (options for both questions ranging from "never" to "more than 8 times").

READING HABITS

Participants were asked how many minutes they read for pleasure each day.

Reading Comprehension Subtest

A cut-time version of the Nelson Denny Reading Comprehension subtest (Form F; Brown, Bennett, & Hanna, 1981) was used. Following Cunningham and Stanovich (1997), the first passage and final passage from the test, along with their 12 questions, were not given, shortening the administration time to 14 minutes. Students read six passages and answered 24 questions. The split-half reliability of the test for the alternate form reliability reported in Brown et al. was .77. Reliability for this group of students was somewhat lower (Cronbach's alpha = .68), but still acceptable. Raw scores (0 to 24) were used in the analysis.

Print Exposure Measures

AUTHOR RECOGNITION TEST

The Author Recognition Test (ART) was designed to measure how much students read for pleasure outside of the classroom. Due to the tendency of socially desirable responses on topics such as outside reading, the ART was developed explicitly to provide a more objective measure of "print exposure." Previous research has established that the ART produces results convergent with more elaborate measures of outside reading, such as diary studies (Allen, Cipielewski, & Stanovich, 1992) and predicts reading behavior in natural settings (West et al., 1993). It has also been found to correlate with other measures of literacy achievement (see McQuillan,

1998a, for a review). The ART used here consisted of a checklist of 24 names, including 16 popular authors and 8 "foils" or false names to correct for guessing. The bestseller and popular authors were taken from a previously developed checklist (Cunningham & Stanovich, 1997) used with high school students. The foils were drawn from the editorial board listed in a 1997 issue of *Applied Psycholinguistics*.

Scores on the ART were calculated by taking the proportion of real authors checked (real items checked divided by 16) minus the proportions of foils checked (foils checked divided by 8) to correct for guessing (Cunningham & Stanovich, 1997). Other methods of calculating scores for "signal detection" checklists have been found to produce very similar results (McQuillan, 1996; Kim & Krashen, 1998). Reliability of the ART was modest (Cronbach's alpha = .52).

MAGAZINE RECOGNITION TEST

The construction and administration of the Magazine Recognition Test (MRT) followed closely that of the ART. The MRT was used to balance the heavy book-orientation of the ART, tapping another potential source of outside reading for students. Names for the 44 item list were taken from a previously developed MRT for high-school-age students (Cunningham & Stanovich, 1997), with 29 real magazines and 14 false ones. The list of real magazine titles included high circulation periodicals as well as those specifically targeted at teens, with some attempt to include a mix of genres. The foils did not appear in a standard reference list of over 60,000 periodicals (see Stanovich & West, 1989, for details). The scoring procedure was identical to that used for the ART, producing a percentage corrected for guessing. As with the ART, reliability of the instrument was modest (Cronbach's alpha = .51).

Results

Descriptive Findings

ACCESS TO PRINT AT HOME, IN SCHOOL, AND IN THE COMMUNITY

Descriptive statistics for all variables are shown in Table 1. The participants in this study came largely from homes of parents with a high school degree or less (70.8%), and the number of books in

TABLE 1. Descriptive Statistics (N = 24)

Variable	Mean	Standard Deviation	Range
1. Age	17.50	.38	16.5–17.9
2. Parent's Level of Education (1 to 5 scale)	2.83	1.23	1–5
3. Books at Home (Total)	133.20	82.11	30–250
4. Books at Home (Interesting)	39.60	51.83	5–250
5. Books Personally Own	12.40	11.48	3–38
6. Interesting Books at Home Not Owned by Student	28.28	48.44	0–232
7. Home Receives Periodical (1 = Yes, 0 = No)	.68	.47	0–1
8. No. of Periodicals Received at Home	1.80	1.80	0–6
9. Books Purchased in Last Month	1.32	1.24	0–5
10. No. of Visits to Public Library in Last Month	2.00	2.16	0–8
11. Time to Travel To Public Library (minutes)	7.16	3.78	3–13
12. Times Taken to School Library by Teacher/Month	1.92	1.95	0–6
13. Visits to School Library On Own in Last Month	3.48	3.61	0-10
14. Free Reading Per Day (minutes)	34.64	33.55	1–120
15. Reading Comprehension (0 to 25 scale)	11.95	3.90	4-19
16. Author Recognition (Percentage Correct)	.10	.09	.00–.33
17. Magazine Recognition (Percentage Correct)	.14	.10	.00–.39

the home (133) was close to that reported in a recent study of children and young adults in the United States (137) (Purves & Elley, 1994). The number of books at home that students thought were interesting enough for them to read, however, was considerably less than the total number available (about 30%). Students owned a relatively small fraction of the total number of books in the family (average of 12.40), and there were only a small number of newspapers or magazines subscribed to or books purchased by the students over the last month.

We were also interested in student access to print at school and in the community. Since all the students attended the same high school and lived in the same community, differences in school

and public library quality were not confounding factors here. Students indicated that they used the library about twice a month in the community, although many students (40%) reported no public library visits in the past month. This may have been due to the time of year (late May/early June), when students were busy with final exams and projects that may have interfered with them visiting the library for free reading materials. Voluntary visits to the school library were more frequent, with only 28% reporting no visits in the past month.

Of greatest interest to us were those variables related to print access over which (it can be assumed) students had little or no control, what we termed *involuntary* access. These would include 1) the number of books in the home that they did not own (but would be interested in reading or have read); 2) the number of times their teachers took them to the public library; and 3) the time it took them to travel to the school library. The number of books in the home not owned by the student, yet still considered by them interesting enough to read, was calculated by subtracting the number of books personally owned by the student from the number of books in the home the student found interesting to read or have read for pleasure. The overall average number was found to be 28.28. For a few students, this calculation produced a negative number. This meant that students had few books in their homes belonging to parents or siblings that they found interesting enough to read and that some of their own books were not interesting to them. This is not all that improbable, given that some of the books personally owned by students may have been gifts or not amenable to leisure reading (e.g., references books).[2] The average number of times students were taken to the school library in the previous month was 2, although again 40% indicated that they had taken no trips to the library with any of their teachers. The average travel time to the closest public library was about 7 minutes. Most students (about 64%) reported driving to the library, with another 28% indicating that they walked there.

READING FREQUENCY AND READING COMPREHENSION

Three measures of reading frequency or "print exposure" were taken. Unfortunately, two of these, the ART and MRT, suffered

2. In such cases, the number was set to zero.

from clear floor effects, as can be noted in Table 1. The mean score on the ART was low, with an average score of only 10% correct, and nearly half scoring less than 6% correct. The MRT results were only slightly better, with a mean score of 14%. These versions of the ART and MRT were clearly too difficult for this group of students, although they had been developed for high school students in another study (Cunningham & Stanovich, 1997). The ART and MRT also suffered from only low to modest reliability, as noted above. The Free Reading time self-report was the third print exposure variable, with students reporting an average of about 35 minutes per day. Due to the skew of this variable's distribution, a log (base 10) transformation was performed on it to allow for further analysis (SPSS, 1997).

Attempts to create a composite index of print exposure, combining the three measures, or just two of the three, proved unsuccessful. Reliability for the composite measures were unacceptably low, in the range of .50–.55 (Cronbach's alpha). This may be because the free reading report and the ART and MRT were tapping slightly different types of print exposure: Free Reading time taps the amount of reading in which students currently engage, while the ART and MRT are probably indicative of cumulative reading amount and breadth. Previous research with adults has found that self-reported measures of free reading make a separate contribution to explaining the variance in reading comprehension scores apart from the ART and MRT (Stanovich & Cunningham, 1992). It was thus decided to use all three measures of print exposure in the correlational and multivariate analyses to follow in order to test the possible differential effects that the indicators of print access would have on both current and cumulative measures of reading frequency.

Correlational Analysis and Multiple Regression Analysis

Table 2 shows the intercorrelations of all the principal variables. Parental education was positively and significantly correlated with the total number of books in the home and the number of books purchased by the student, but not with reading comprehension scores, although it fell just short of statistical significance ($p = .06$). Both findings are consistent with previous research on the relationship between SES measures, print access, and reading achieve-

TABLE 2. Correlation Matrix (N = 24)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Parent Education	1.00														
2. Books at Home	.42*	1.00													
3. Interesting Bks.	.42*	.54*	1.00												
4. Personal Books	.27	.36	.34	1.00											
5. Int. Bks/Not Own	.39	.47*	.98*	.14	1.00										
6. Num. of Period.	.35	.21	−.05	.09	−.08	1.00									
7. Bks. Purchased	.48*	.34	.36	.48*	.27	.18	1.00								
8. Pub. Lib. Visits	−.13	−.03	.03	.35	−.06	.00	.28	1.00							
9. Time to PL	−.14	.36	−.13	.04	−.15	.07	.10	.02	1.00						
10. Sch. Lib. Visits	−.04	−.05	−.22	−.29	−.18	.12	.09	.25	.12	1.00					
11. Taken to SL	.07	.18	.02	.20	−.05	−.01	.28	.43*	−.34	.24	1.00				
12. Free Reading	.27	.06	−.09	.46*	−.19	.22	.38	.46*	−.09	−.22	.46*	1.00			
13. Read. Comp.	.40	.18	.19	.60*	.10	.31	.42*	.36	.04	−.12	.18	.55*	1.00		
14. ART	.08	.11	.34	.55*	.24	.08	.08	.16	.07	−.22	.09	.43*	.45*	1.00	
15. MRT	.09	−.17	.22	.36	.16	.25	.05	−.15	.03	−.08	−.10	.14	.55*	.51*	1.00

* = $p < .05$

ment (McQuillan, 1998a; Ortiz, 1986). Students who had more books overall in the home had more books they found interesting to read, although only the number of books personally owned by the student correlated significantly with reading comprehension ($r = .60$). Public library visits and voluntary trips to the school library were positively correlated, as was the number of times students were taken by their teacher to the school library and public library visits. Neither the ART nor the MRT correlated with any of the print access measures save for number of books personally owned by the student (correlation with ART = .55).

THE IMPACT OF READING FREQUENCY ON READING COMPREHENSION

The effects of print exposure on reading comprehension were tested by conducting a series of hierarchical regression analyses, using our three measures of reading frequency, Free Reading, the ART, and the MRT. The purpose of the separate analyses was to determine what, if any, unique contributions the three measures made to explaining the variance in reading comprehension. Since parental education is also thought to influence reading achievement (e.g., more educated parents may read more, providing more positive reading role models for their children), we controlled for the highest level of parental education in all of the analyses. Table 3 shows the results of several forced order, hierarchical regression analyses. Table 4 displays the results of a simultaneous regression, with all the variables entered into the equation.

Two of the three measures of reading frequency, Free Reading and the ART, were significant predictors of reading comprehension after controlling for parental education. This finding is consistent with previous research on the independent contribution of print exposure to reading ability. The self-reported Free Reading proved to be the most consistent and robust predictor of reading comprehension, controlling for the effects of parental education. Free Reading explained a significant amount of variance in all three analyses shown in Table 3, above and beyond that accounted for by either the ART or the MRT (Analysis 2 and 3). The checklist measures, on the other hand, were unable to account for additional variance after the entry of the Free Reading variable (Analysis 1). In the simultaneous regression analysis (Table 4), only Free Reading was a significant predictor of reading scores.

TABLE 3. Forced Order Hierarchical Regression Predicting Reading Comprehension Scores (N = 23)

Step	Variable—Forced Entry	R	R2 Change	F to enter
	Analysis 1			
1	Parental Education	.395	.156	3.877
2	Free Reading	.645	.260	8.891**
3	ART	.684	.052	1.857
4	MRT	.685	.002	.067
	Analysis 2			
2	ART	.570	.170	5.025*
3	Free Reading	.684	.142	5.079*
4	MRT	.685	.002	.067
	Analysis 3			
2	MRT	.456	.053	1.327
3	ART	.571	.117	3.303
4	Free Reading	.685	.144	4.889*

*$p < .05$, **$p < .01$

THE IMPACT OF PRINT ACCESS ON READING FREQUENCY

A conservative test of the impact of print access on reading frequency includes at least two conditions. First, the reading ability of students must be controlled for. Better readers engage in more reading, so the impact of print access on reading frequency must be assessed independently of the likely confound of reading ability. Second, the measures of print access must be ones that are "involuntary," that is, uninfluenced by student preferences or prior motivation. Clearly students who are more motivated to read will engage voluntarily in certain activities related to access, such as purchasing books. What is instead needed are measures of print access over which the students have no control. Since all of the

TABLE 4. Simultaneous Regression Predicting Reading Comprehension Scores (N = 24)

Predictor	B	Beta	Stand. Error	T	P
Constant	4.122		2.269	1.812	.087
Parental Education	.666	.212	.570	1.167	.258
Free Reading	3.424	.439	1.549	2.211	.040
ART	8.63	.222	8.565	1.008	.327
MRT	1.822	.053	7.036	.259	.799

R = .685, R2 = .47, Adj. R2 = .35, $F = 3.984$, $p < .05$

students in this study went to the same school and lived in the same community, access to books could not be measured by looking at the number of books or funding of the school and public libraries, as it has in previous studies (e.g., Lance et al., 1993). Similarly, we could not use the number of times students chose to visit the school or public library, since those measures are very likely linked to reading proficiency. Finally, we could not use the total number of books in the home, since it could be argued that this number is also influenced by the amount of books students themselves choose to buy or bring into the home.

We did have three measures of access that can be considered to be relatively free of "contamination" by student preference: 1) the number of interesting books in the home not owned by the student, 2) the number of times teachers took students to the school library, and 3) the time it takes students to travel to the public library. None of these are under the control of the student, and all can theoretically influence reading frequency directly or indirectly. Students with more interesting books in the home and who are taken to the library more by their teachers are placed in greater contact with more print resources. Students who have shorter travel times to the public library have more convenient access to books in the community, and tend to use the library more (Haynes & Palmer, 1983).

Following Cunningham and Stanovich's (1997) analysis of the impact of print exposure on various cognitive measures, we used a step-wise, hierarchical regression to measure the independent contributions of print access to reading frequency, entering the likely confound of reading comprehension first, followed by the three "involuntary" sources of reading materials.[3]

3. While parental education is also a possible contributing factor, we decided not to use it for this analysis, since previous research has shown that, while more parental education is associated with more books in the home (e.g., McQuillan, 1998a; Ortiz, 1986), the key variable associated with reading frequency and achievement is not SES, but the print access itself. Having a direct measure of print access obviates the need to include an SES control. This, in fact, is what our analysis of reading comprehension above has shown (Tables 3 and 4): Reading comprehension is predicted best by reading frequency, not by parental education. Similarly, parental education was not in turn related to any of our measures of reading frequency, as noted in Table 2. Finally, multiple regression analyses on the dependent variable, Free Reading, found that two indicators of "voluntary" print access (visits to the public library and personal books owned) were both significant predictors, but parental education was not.

TABLE 5. Change in R^2 for Each Step in Hierarchical Regression Predicting Print Exposure Measures (N = 24)

		Dependent Variables		
Step	Variable—Forced Entry	Free Reading	ART	MRT
1	Reading Comprehension	.307**	.203*	.092
2	Books at Home	.064	.039	.017
3	Travel Time to Pub. Lib.	.000	.035	.011
4	Taken to School Library	.121*	.000	.011

** = $p < .01$, * = $p < .05$

Table 5 shows the results of the step-wise regression on our three measures of reading frequency, self-report Free Reading, the ART, and the MRT. All six possible forced entry combinations were attempted for the three independent variables related to print access used, and all produced roughly the same effects as illustrated in Table 5. In no case did travel time to the public library or number of interesting books at home not owned by the student result in a significant change in R squared, once reading comprehension was controlled for. In all cases, the number of times students were taken to the school library added a significant amount of the variance explained for the Free Reading dependent variable, but not for the ART or the MRT.

Table 6 contains the results of the simultaneous regression analysis on the Free Reading variable, with all variables entered into the equation. Only the number of times students were taken to the school library and reading comprehension are significant predictors of reading frequency with all variables entered. The positive beta weight indicates that more trips to the school library

TABLE 6. Print Access Measures and Reading Ability as Predictors of Free Reading: Simultaneous Regression (N = 24)

Predictor	B	Beta	Stand. Error	T	P
Constant	.329		.338	.973	.345
Reading Comprehension	.0639	.527	.020	3.128	.006
Books at Home	–.0019	–.205	.002	–1.220	.242
Travel Time to Pub. Lib.	.0154	.125	.022	.693	.495
Taken to School Library	.101	.382	.047	2.131	.046

R = .70, R2 = .49, Adj. R2 = .39, $F = 4.607$, $p < .005$

was associated with more free reading. In the ART and the MRT simultaneous regression analyses, the omnibus F tests were not significant (ART: $F = 1.821$, n.s.; MRT: $F = .725$, p = n.s.[4]).

Discussion

This exploratory study is limited by several factors. First, the number of participants was small, limiting our ability to generalize to a larger student population and making statistical analysis only preliminary. Further research with a larger sample size is needed to confirm the present findings. Second, the low reliability and potential floor effects seen on some of the measures, especially the ART and MRT, make any conclusions based on those instruments suspect. Third, like all self-report data, survey data from the participants is open to distortions due to social desirability. Fourth, there may have been other important sources of print access not measured by our instruments, such as Internet or other electronic forms of text.

Despite these shortcomings, the findings of this study are consistent with other data on the relationship between print access and reading frequency. As in previous research (Krashen, 1993; McQuillan, 1998a), this study found that the home does not appear to be a particularly rich source of reading materials for students from working class and lower-income homes. When we consider the number of books that students find interesting among those present in the home, combined with the average number of newspapers and periodicals, the figures stands at a little more than 40 books and periodicals per student. This number is far less than is typically reported in large-scale surveys of students and their print environment (Purves & Elley, 1994). Students report buying relatively few books on their own each month, and owning fewer than an average of 13. Nevertheless, the number of books owned by the students in this study was significantly correlated with both reading frequency and reading achievement. It is not clear to what extent parental income may have been a contribut-

4. Regression analyses using total number of books at home and personal books subtracted from total number of books produced nearly identical results as our measure of interesting books to read in the home not owned by the student.

ing factor here, since an attempt to measure household earnings was unsuccessful.[5]

In general, the study confirmed previous research on the strong, independent impact that reading frequency plays on the acquisition of reading competence, controlling for socioeconomic factors (Ortiz, 1986). Both the ART and Free Reading were significant predictors of reading ability, controlling for parental level of education. Since SES is typically correlated with reading achievement (White, 1983), it is often assumed that it is itself responsible for variations in achievement. But the results of this study and others (see McQuillan, 1998a, for a review) suggest that it is not SES differences per se that lead to variations in reading ability among students, but rather the factors typically associated with SES, such as the amount of access students have to reading materials and the subsequent increased amount of reading done.

The ART and MRT instruments used to tap reading frequency suffered from both floor effects and low reliability, yet still managed to correlate significantly with reading comprehension and, in the case of the ART, with some measures of print access. The self-report Free Reading variable appeared, however, to be the most robust indicator of the amount of reading done by students, given its ability to predict reading comprehension scores even after controlling for the effects of the ART and MRT, and to remain the only significant predictor of reading comprehension in a simultaneous regression analysis (Table 4). The superiority of the self-report Free Reading measure over the checklist indicators is somewhat surprising, given that there is known to be social desirability problem in reading questionnaires of this type (see Stanovich & Cunningham, 1992, for a discussion).

The results of our analysis on the effects of three "involuntary" measures of print access at home, in the community, and at school provide evidence that the availability of reading resources is associated with more self-reported free reading, independent of reading ability. The more times students were taken to the school library

5. An attempt was made to measure the level of household income among the participants, but more than half (13/24) of the students reported they did not know how much their parents earned each year. For a discussion of the problems with self-report data on parent education and income variables among children and adolescents, see McQuillan (1998a).

by their teacher, the more free reading they engaged in, as measured by the Free Reading variable. This finding is consistent with school- and district-level studies that have found that greater access to the school library is associated with higher levels of reading achievement (Krashen, 1995; Lance et al., 1993). The number of interesting books in the home not owned by the student and the time it took to reach the local public library, however, were not significantly related to free reading. This may be due to 1) the lack of importance of home and public library sources for free reading at this age level (high school); 2) "floor effects" in the number of books at home that are of interest to the student, as noted previously; and/or 3) the restricted range of time it takes to reach the public library in the particular sample (the standard deviation was only about 4 minutes), given that all participants attended the same high school from roughly the same neighborhood. It may also be that time of year affects sources of books. Entwisle and Alexander's (1994) finding that students of all abilities and SES ranges made approximately the same amount of progress in reading when school was in session, but diverged when school was not in session, suggests that home and public library sources can be more important determinants of free reading in the summer and winter break months.

The present findings of this exploratory study on print access and reading frequency lead to further questions about both the practical and theoretical issues involved in motivating students to read more for pleasure. On a practical level, the present study suggests that taking students to the school library may lead to more reading. A small scale, quasi-experimental study with elementary school students recently found that taking children to a library did, in fact, lead to more reading by the students (Ramos, 1997). Ironically, there is also evidence that such access to the quality libraries is often given more to students of higher ability than to low ability readers (LeMoine, O'Brian, Brandlin, & McQuillan, 1997). In addition, students in low achieving schools often have the worst classroom and school libraries (Allington, Guice, Baker, Michaelson, & Li, 1995; Pucci, 1994). More experimental research is needed to test the effects of increasing classroom and library access to books on reading frequency and proficiency.

From a theoretical perspective, the precise role of one's physical environment on interest and motivation in reading still needs

further specification. What sort of environments or types of access are associated with more reading for given age groups? What are the additional contextual factors that may influence reading behavior in the physical environment? More direct measures of interest and motivation within given physical environments may also help determine which mechanisms are at work in leading students to engage in more reading when in a "print rich" setting.

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