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Growth in reading and how children spend their time outside of school

FEW STUDIES have provided precise data on how much reading school children do. Fewer still have examined the relation between amount of reading and reading achievement. In the studies reported here, 155 fifth-grade students wrote down every day on activity forms how many minutes they spent on a wide range of out-of-school activities. Forms were completed for periods ranging from 8 to 26 weeks. The distribution of times for most activities was positively skewed. Among all the ways children spent their time, reading books was the best predictor of several measures of reading achievement, including gains in reading achievement between second and fifth grade. However, on most days most children did little or no book reading.

Progrès en lecture et activités des enfants à l'extérieur de l'école

ON RETROUVE peu d'études pour nous donner des renseignements précis du temps que les élèves consacrent à la lecture en dehors de l'école. Il y en a encore moins études de la relation existant entre ce temps consacré à la lecture ailleurs qu'à l'école et la réussite en lecture. Dans cette recherche, 155 élèves de cinquième année ont rempli à chaque jour une grille d'activités en y inscrivant le nombre de minutes consacrées à de multiples activités extra-scolaires. Les élèves ont rempli ces grilles durant des périodes variant de 8 à 26 semaines. Pour la plupart des activités, la distribution du nombre de minutes consacrées à chacune n'était pas symmétrique, avec des nombres de minutes très élevés pour quelques enfants, en comparaison de la majorité. Parmi toutes les façons dont les enfants passaient leur temps, la lecture était le meilleur prédicteur de plusieurs évaluations de la réussite en lecture, de même que pour les progrès en lecture à survenir entre la deuxième et la cinquième année. Néanmoins, la plupart des enfants lisaient peu ou pas de livres chaque jour.

El crecimiento en la lectura en niños y cómo éstos usan su tiempo fuera de la escuela

POCOS ESTUDIOS han provisto datos precisos al respecto de cuánto leen los niños en edad escolar fuera de la escuela. Menos estudios aún han examinado la relación entre la cantidad de lectura fuera de la escuela y los avances en lectura. En los estudios reportados aquí, 155 estudiantes de quinto año escribieron diariamente en formas de reporte de actividades cuántos minutos por día pasaron haciendo un gran rango de actividades fuera de la escuela. Las formas fueron completadas por períodos que variaron de 8 a 26 semanas. La distribución de los tiempos para la mayoría de las actividades fue asimétrica, con los tiempos de unos cuantos niños mucho más altos que los tiempos de la mayoría. Entre las muchas maneras que los niños usaron su tiempo, leer libros fue el mejor predictor de varias medidas de logro en lectura, incluyendo aumentos en desempeño en lectura entre el segundo y el quinto grado. Sin embargo, la mayoría de los niños leían muy poco o nada diariamente.

Leseentwicklung und wie Kinder ihre Zeit außerhalb der Schule verbringen

NUR WENIGE STUDIEN geben exakte Einzelheiten darüber, wieviel Kinder außerhalb der Schule lesen. Noch weniger wurde untersucht, welche Verbindung besteht zwischen der Lesehäufigkeit außerhalb der Schule und der Lesefähigkeit. In den Studien, die hier vorliegen, schrieben 155 Fünfklässler jeden Tag auf Aktivitätenfragebogen, wieviele Minuten sie mit den vielen angeführten Tätigkeiten verbrachten. Die Fragebogen wurden in einem Zeitraum von 8–26 Wochen ausgefüllt. Die Zeiteinteilung für die Tätigkeiten wurde positiv abgeschrägt. Von den verschiedenen Dingen, mit denen Kinder sich beschäftigen, war das Lesen von Büchern die beste Voraussetzung für verschiedene Maßstäbe von Leseleistung, darunter auch ansteigende Leseleistung zwischen dem zweiten und fünften Schuljahr. Allerdings lasen die meisten Kinder an den meisten Tagen wenig oder gar nicht.

> Every habit and faculty is preserved and increased by correspondent actions—as the habit of walking, by walking; or running, by running.
>
> (*How the semblances of things are to be combatted.* —Epictetus)

One of the success stories of the educational research of the 1970s was to establish that reading achievement depends upon how children spend their time in school (Denham & Lieberman, 1980; Rosenshine & Stevens, 1984). Much less is known about the influence of how children spend their time out of school, but it would be myopic to suppose that it is unimportant. The present paper reports an intensive study of children's out-of-school activities, so far as we are aware the most intensive study that has yet been done. Children completed a daily record of activities for periods ranging from 2 to 6 months. Although we paid special attention to reading, we made a comprehensive assessment of children's activities outside of school. Individual and temporal patterns of activities were studied in some depth. We examined the relationships between time spent in activities and several measures of reading proficiency, and explored the interesting question of whether out-of-school activities are in the causal nexus that produces reading growth.

Most previous research on children's out-of-school activities has suffered from one or more of the following defects: In some cases the focus was narrow—limited, perhaps, to completing homework, watching television, or reading for pleasure. In other cases the method was dubious, depending, for instance, on parents' answers to a questionnaire. Often the time inter-

val probed was brief, as in the single question, answered once, "How many hours did you spend watching television yesterday?" Alternatively, the interval probed was indeterminate, and the response options were vague, as in the question "How often do you find out about the news from magazines? *(Circle one:)* Never. Several times a year. Several times a month. Several times a week. Every day." In many studies only a superficial description of average trends was provided, with little information about differences between individuals or about relationships between factors, and, typically, no empirically grounded insights into possible causes and possible effects.

Two major studies of independent reading have been completed in recent years. The study closest to the present one in scope and method was completed by Vincent Greaney in Ireland (1980). All of the 920 fifth-grade pupils in a sample of 31 Irish primary schools, stratified according to location, completed a diary of out-of-school activities on 3 specified days during a 1-week period. Briefly, children were found to spend large amounts of leisure time in such activities as play, outings, hobbies, television viewing, and helping in the home. Overall, 5.4% of leisure time was spent in reading. The amount of time spent reading comics and particularly the amount of time spent reading books were positively associated with reading achievement.

The other important large-scale study was conducted by Walberg and Tsai (1984), who analyzed data from a stratified, nationwide sample of 13-year-olds who participated in the 1979-1980 National Assessment of Educational Progress. These 2,890 students answered two multiple-choice questions about frequency and amount of leisure reading. Walberg and Tsai found positive relationships between answers to the questions and students' reading achievement. Later in this paper, both the Greaney (1980) and the Walberg and Tsai (1984) investigations will be discussed again in order to reconcile their findings with those of the present study.

To recapitulate, then, the purposes of the study reported here were (a) to describe children's out-of-school activities, with a special focus on reading, and (b) to examine the relationship of out-of-school activities to reading achievement.

Method

Subjects

The subjects were 155 fifth-grade students, 52 from two classrooms in a village school and 103 from five classrooms in a school in a middle-class area of a small city. Both communities are in east central Illinois. There were 85 boys and 70 girls in the total sample. Although there were some blue collar, low-income, and minority children in the sample, these groups were underrepresented in terms of their proportions in the nation as a whole. On the Metropolitan Achievement test, the sample was above the national average (mean percentile rank = 62.9), but showed a typical spread in ability (*SD* = 25.6). Although the sample included a number of poor readers, no child was identified by teachers as a nonreader.

Activity forms

Based on discussions with two classes of fifth-grade students, we developed an initial activity form designed to divide children's activities into mutually exclusive and exhaustive categories. The questions on this initial form were refined on the basis of a 3-day tryout and further discussion with the children.

The final activity form consisted of one side of a single sheet of paper on which there were questions such as the following:

I spent _____ minutes listening to music.

I spent _____ minutes eating dinner.

Several questions asked for further specification of the activity:

I spent _____ minutes playing a sport called _____ .

I spent _____ minutes reading a book.
The book was called _____ .
The book was written by _____ .

It would have been desirable to ask detailed questions about every type of activity in which children engage, but this was not feasible. Completing the forms would then have taken too much time over the rather extended duration of this study, and might have jeopardized the cooperation of the schools and of the children themselves. Thus, finely discriminating questions were asked only about categories that especially interested us, such as reading and homework, whereas other questions probed activities lumped together in broader categories.

Slightly different versions of the activity form were used in the two schools. Children in the village school were asked to make 16 separate time estimates, whereas the children in the city school were asked to make 20 estimates. In three cases the form used in the city school divided what was a large category in the village school into two smaller ones; therefore, it was possible to get approximately the same information for the two schools by combining these smaller categories. The form used in the city school also included an "Other" category.

Children from the village school filled out activity forms in the spring for an 8-week period during March and April. Children from the city school began filling out forms the following fall for a 26-week period beginning in November.

Procedure for collecting activity data

Steps were taken to try to make sure the information that the children provided about their activities was as complete and as accurate as possible. The children were trained explicitly to fill out the forms; they were provided with help of several types while they were completing the forms; and they were given incentives to encourage a high level of compliance. (Later we also conducted statistical checks on rate of compliance, outliers, and the shapes of distributions.)

One of us explained to each class how to complete the activity form. The children were encouraged to think of the nonschool part of each day in terms of regular mileposts, such as getting up, eating breakfast, leaving for school, getting home from school, participating in regularly scheduled extracurricular practices or lessons, eating dinner, watching favorite TV shows, going to bed, and going to sleep. Children were provided with an instruction sheet, to which they could refer, that explained the kinds of activities that should be included under each question. They were urged to become "time-conscious," and to make mental notes of when they started and stopped doing things.

One of us spent a considerable amount of time with the children on the arithmetic of time calculations. When we discovered that some children had trouble converting large blocks of time to minutes, we provided a conversion table that listed hours and quarters of an hour and the corresponding numbers of minutes. When we discovered that some children were underreporting time, we urged them to make sure they accounted for at least 330 minutes on weekdays and 630 minutes on weekends and holidays. One of us came back 5 straight days to answer questions, discuss problematic cases, and help children complete the forms.

Children completed an activity form each school day that covered out-of-school activities the previous day. In six of the seven classrooms, completing activity forms was the first task in the morning when school began. In the remaining classroom, the forms were usually filled out right after lunch. Once the children had had about a week of experience, it took from 5 to 10 minutes to complete a form. Following weekends and holidays, children from the village school were asked to complete forms for these days as well. Children from the city school had to complete forms covering these days during free time.

Compliance was high in the village school and was maintained throughout the 8 weeks of the study. The ratio of forms actually received to the total that would have been possible if every child had turned in a form for every one of the 57 days, expressed as a percentage, was 91%. We took pains to conceal from the children in the village school that reading was our primary interest, and there was no indication that the children ever became aware of this interest.

Compliance was lower in the city school, mainly because classroom time was not provided to complete weekend and holiday forms

and because cooperation, which was voluntary, tailed off toward the end of this very long study, after about 18 weeks. These problems were not unanticipated, and an incentive system was introduced to try to keep the children motivated. Briefly, points were awarded for completing forms, with extra points given for weekend and holiday forms. Children who accumulated enough points received a T-shirt, which they had helped design, at the end of the study; 43 of the 103 children got T-shirts. That the incentive system was not entirely successful is indicated by the fact that just 48% of the total possible number of forms over all 26 weeks were actually received. We tried to conceal our special interest in reading from the children in the city school; however, a couple of the teachers inadvertently referred to the investigators as people from the Center for the Study of Reading.

Analysis of activity data

Generally, there was a reasonable correspondence between the time reported on the activity forms and the time available in the day. Average total reported time was somewhat less than estimated nonschool, nonsleeping hours, but this is plausibly attributable to the fact that the activity forms did not include questions that covered such activities as dressing and undressing, grooming and personal hygiene, or getting to and from school.

Of course, on some days some children reported unrealistically large or small amounts of time. Several techniques were tried for dealing with outliers: First, deviant figures were thrown out. Second, deviant figures were replaced with figures either one standard deviation above or one standard deviation below the mean (after a normalizing transformation; see below). Third, all figures were proportionalized to average total reported time. In the end, we dropped one child with very deviant scores. Otherwise, analyses involving figures that had been manipulated in one or another of these ways differed hardly at all from analyses involving all the time figures in their simple form. Hence, we used the simple figures, confident that our results and conclusions were not unduly influenced by outliers.

There was reason to worry that the results would be confounded by variations between the children in the extent to which they complied with the demands of the study. As already noted, compliance became quite poor at the city school near the end of the study. However, the results did not change much when the last 8 weeks of data from the city school were dropped, so all of the data are included in the analyses reported in this paper. One measure of compliance is the percentage of days on which a child returned an activity form. This variable correlated only +.01 with reading comprehension percentile. Similarly, average total minutes reported per day correlated +.02 with reading comprehension percentile. Thus, any fear that low compliance or variability in compliance would queer the results seems groundless.

Throughout this paper, book reading time includes only instances when the child wrote down either the title or the author of the book, or both. When the instances in which the child did not state the title or the author are included, total book reading time is slightly higher (M = 10.4 minutes per day, SD = 17.0), but its correlation with reading comprehension percentile goes down somewhat. This finding suggests that constraining the measure to instances where the child can state the title or the author gives a more valid indicator of actual reading.

Most of the time variables were highly skewed, as is apparent from Table 1, which shows that the medians are smaller than the means and that the standard deviations are large in relation to the measures of central tendency. A transformation was sought which would normalize the time variables and would linearize their relationships with reading achievement. The one finally chosen was the natural logarithm of average time per day in minutes, m, plus a small constant: log (m + .5). This did a good overall job of satisfying both objectives. Skewness and kurtosis were improved for 11 of the 14 variables; in most cases, the distribution of transformed times was within normal bounds. The transformation increased the absolute value of the correlation between a time variable and Metropolitan reading comprehension percentile in eight cases and made it smaller in

six cases. In most cases, the change was slight. However, when regression analyses were done predicting reading comprehension percentile, percentage of vocabulary known, and reading speed, in each case more variance was explained when the transformed time variables were used as predictors, instead of the raw time variables.

Special attention was paid to amount of time spent reading books. The transformation, log (m + .5), made the distribution almost perfectly normal. Following the transformation, the correlation with reading comprehension percentile went up considerably, and the residuals were evenly distributed around the function predicting reading comprehension percentile.

Three variables were not helped by the log (m + .5) transformation. In the cases of time spent eating dinner and time spent going out, the perturbations were minor. In the case of time spent watching TV, the (negative) correlation with reading comprehension percentile was reduced quite a bit (i.e., moved toward zero), suggesting that the relationship was not log-linear. Later in this paper, time spent watching TV is given special treatment. Another factor that had to be given special treatment was time spent doing homework, for reasons that will be explained later.

Procedures for testing reading proficiency

A battery of three reading tests was given twice, once at the beginning of the period during which the activity forms were completed, and again following this period. The first test was the reading comprehension test from the Metropolitan Achievement Tests.

The second test was a checklist vocabulary measure, of the type described by Anderson and Freebody (1983). Subjects indicated whether they knew the meanings of 97 English words, representing a wide range of difficulty, intermixed with 66 close-to-English nonwords. A subject's score on the test was the percentage of words marked as known minus a correction for the number of nonwords marked as known. Anderson and Freebody (1983) have reported that a checklist test of this type has much higher validity as a measure of vocabulary knowledge than a standardized multiple-choice test.

The third test was a measure of reading speed. Subjects read for 10 minutes a lengthy, interesting selection from a fifth-grade basal reader not in use in these classrooms. Every 2 minutes they made a slash mark at the point in the text where they were then reading. The measure was words read per minute, defined as the number of words in the text read during the first three 2-minute intervals, divided by 6. This procedure provided reading speed data for all subjects, even the few who seemed to have completed the passage in less than 10 minutes.

The foregoing tests were administered by us. We also obtained standardized reading test results from school files for Grade 2. Total reading percentile scores were available for most children from the village school on the Stanford Achievement Test and for most children from the city school on the Metropolitan Achievement Test.

Gaps in reading proficiency data were plugged in ways that made maximum use of available information. For reasons that will be explained in the next section, the major analyses in this study involved the three reading tests administered in the middle of the fifth grade. Thus, missing scores on any of these three tests were estimated via a regression equation from scores on the same test administered at the end of the fifth grade. In this manner, 14 missing reading comprehension percentile scores, 16 missing vocabulary scores, and 19 missing speed scores were estimated. A simpler method of estimating missing second-grade total reading percentiles was used. In 9 cases, the third-grade reading percentile was used; in 6 cases, where there was no third-grade score, the fourth-grade percentile was used. The number of subjects available for analyses ranged from 143 to 155. Naturally, these methods of plugging the holes left by missing data involved some error, but they introduced less error than would the standard practice of plugging holes with mean scores. And, they were less wasteful than wholesale discarding of cases, which seemed wanton considering that children con-

tributed as much as 25 hours of their time for this project.

Analysis of reading proficiency data

The original plan for this study was to measure children's competence as readers, determine their out-of-school activities for a period of several months, measure their competence again, and then assay the influence of the activities on reading growth during the several-month period. This plan had to be abandoned. One problem was that by the date of the second administration of the tests, it was near the end of the school year, the children were tired of being indoors, and many didn't try very hard on the tests. That this is so was suggested by informal observation; for instance, while the children were taking tests, some were staring out the window at other children frolicking on the playground. Also, there is the fact that, if one takes the data seriously, the children in both schools showed negative reading growth, on average, over the course of the study.

An even more fundamental problem overlooked in the initial plan is that out-of-school activities probably are persistent behavior patterns. These behavior patterns probably were established long before we asked children to complete activity forms and probably continued long afterward. Moreover, any proximate influence of individual teachers on children's out-of-school activities—because of homework policy, the priority given to independent reading, and the like—already would have taken hold to some extent by the time of our pretest. The revised plan, therefore, involved keying on the three reading tests administered in the middle of the fifth grade, just before the children began completing the activity forms.

To assay the influence of out-of-school activities on reading growth, we examined the change in reading proficiency from the end of the second grade to the middle of the fifth grade using regression analysis. Because the activity forms were completed during the fifth grade, this approach rests on the assumption that the pattern of children's activities is fairly stable over considerable periods of time. That this is not an unreasonable assumption with respect to reading, at least, is suggested by interviews with 16 children from the village school and their parents, which revealed that those who read frequently in the fifth grade first began to do so in the third or fourth grade. (A summary of these interviews is presented in Fielding, Wilson, & Anderson, 1986.)

For the sake of clarity and economy of presentation, the data from the two schools were pooled. Every analysis done with pooled data was also done with the data from each school separately. With just a few exceptions, the findings with the separate data sets were very similar.[1] Nonetheless, pooling the data from the two schools was not as simple as combining the data. The reason is that the two sets of data were not quite commensurate, because the battery of three reading tests was given for the first time 4 months earlier in the city school than in the village school, and because the scores pulled from files in the two schools to estimate reading ability in the second grade were based on different standardized tests. We included school as a factor in the analyses to preclude artifacts that otherwise would have arisen because of these differences.

Results

Table 1 presents the means, medians, and standard deviations for the time variables, and the means and standard deviations for the transformed time variables. Included are variables representing the time children reported spending in 14 kinds of activities. These are the activities included on the activity form used in the village school, except for homework. Three separate homework activities were collapsed into one category, because there was no additional information in the fine subdivisions. Table 2 presents the means and standard deviations on the reading proficiency measures. Mean performance on the vocabulary measure correlated .74 with mean reading comprehension percentile. Mean reading speed correlated .40 with reading comprehension, and .47 with vocabulary performance.

Table 1 Means, medians, and standard deviations of minutes per day in out-of-school activities

Activity	Minutes per day			Log minutes per day[a]	
	M	Median	*SD*	*M*	*SD*
Doing chores	15.1	10.7	14.5	2.2	1.2
Doing homework	18.9	14.5	17.3	2.6	1.0
Eating dinner	27.1	26.9	10.2	3.2	0.4
Going out	98.6	93.7	58.2	4.4	0.8
Listening to music	30.8	18.0	46.1	2.8	1.2
Playing games	17.1	10.3	21.7	2.2	1.2
Practicing/lessons	13.7	9.0	15.1	1.9	1.5
Reading books	10.1	4.6	16.8	1.5	1.3
Reading comics	2.1	0.2	4.4	0.18	1.1
Reading mail	1.4	0.4	2.6	0.16	0.8
Reading newspapers and magazines	4.8	2.0	6.8	0.97	1.2
Talking on phone	8.1	4.3	9.7	1.5	1.2
Watching television	131.1	111.0	88.4	4.6	0.7
Working on hobby	10.9	3.3	19.9	1.4	1.5

[a]log (m + 0.5).

Table 2 Means and standard deviations on measures of reading proficiency

Measure	Scale	*M*	*SD*
Second-grade			
Total reading	Percentile rank	70.2	24.8
Fifth-grade			
Reading comprehension	Percentile rank	62.9	25.6
Vocabulary	Percentage known	64.4	20.9
Reading speed	Words per minute	179.2	59.7

Table 3 portrays the wide variation between children in amount of reading. The scale is the percentile rank on each of several measures of amount of reading. The figures for average minutes per day of reading come directly from the activity forms. The values for time spent reading *text* include reading newspapers and magazines as well as books. *All reading* includes comics and mail in addition to books, magazines, and newspapers. The words per year figures were obtained separately for each child by multiplying the child's average minutes of reading per day by his or her reading rate in words per minute, and then extrapolating to a full year. Words per year from all reading could not be estimated, because it would not have been reasonable to assume that children cover the same number of words per minute while reading comics and mail as they do while reading books, magazines, and newspapers.

Table 3 Variation in amount of independent reading

Percentile rank[a]	Minutes of reading per day			Words read per year	
	Books	Text[b]	All reading[c]	Books	Text[b]
98	65.0	67.3	90.7	4,358,000	4,733,000
90	21.1	33.4	40.4	1,823,000	2,357,000
80	14.2	24.6	31.1	1,146,000	1,697,000
70	9.6	16.9	21.7	622,000	1,168,000
60	6.5	13.1	18.1	432,000	722,000
50	4.6	9.2	12.9	282,000	601,000
40	3.2	6.2	8.6	200,000	421,000
30	1.8	4.3	5.8	106,000	251,000
20	0.7	2.4	3.1	21,000	134,000
10	0.1	1.0	1.6	8,000	51,000
2	0.0	0.0	0.2	0	8,000

[a]Percentile rank on each measure separately. [b]Books, magazines, and newspapers. [c]Books, magazines, newspapers, comic books, and mail.

The estimates of minutes per day of reading shown in Table 3 are quite reliable. An estimate of the reliability of minutes of book reading per day was obtained by correlating the time reported on odd days with the time reported on the even days during a representative 40-day period when the children were completing activity forms. Using the Spearman-Brown formula, the reliability of the measure of amount of book reading over the 57 days that the typical child in the study completed activity forms was calculated to be .86. We looked at the average amounts of reading day by day and saw no systematic change from the beginning to the end of the study; thus, it is not unreasonable to extrapolate the data to a full year. Nevertheless, the estimates of words read per year shown in Table 3 are not very reliable because the error in the constituent measures is magnified.

Table 4 presents the correlations of the transformed time variables with the measures of

Table 4 Correlations of log minutes per day spent in out-of-school activities with measures of reading proficiency

Variable	Reading comprehension		Vocabulary		Reading speed	
	Status	Growth	Status	Growth	Status	Growth
Second-grade reading	.76	–	.67	–	.41	–
Doing chores	-.05	-.07	-.11	-.12	-.08	-.07
Doing homework	.14	.19	.02	.01	-.03	-.04
Eating dinner	.22	.14	.22	.15	.06	-.01
Going out	.31	.15	.27	.12	.12	-.01
Listening to music	-.22	-.13	-.21	-.06	-.15	-.03
Playing games	.21	.14	.24	.20	.13	.09
Practicing/lessons	.29	.14	.30	.17	.19	.07
Reading books	.39	.29	.32	.17	.33	.23
Reading comics	.10	.19	.13	.18	.13	.16
Reading mail	-.15	-.09	-.17	-.06	.08	.17
Reading newspapers and magazines	-.06	.07	.00	.14	.13	.23
Talking on phone	-.13	.01	-.10	.03	-.15	-.07
Watching television	-.12	-.17	-.05	-.06	.06	.06
Working on hobby	.06	.05	.06	.08	.12	.14

Table 5 Regression of fifth-grade reading comprehension on log minutes per day spent in out-of-school activities

Variable	Fifth-grade status				Second/fifth growth			
	Order of entry	% of var.	Final *F*	Final *B*	Order of entry	% of var.	Final *F*	Final *B*
School	1	0.2	4.76	+ 7.6	1	0.0	16.40	+11.6
Second-grade reading					2	58.4	137.32	+ 0.7
Doing chores			2.99	-	6	1.1	4.42	- 2.4
Doing homework			2.22	+			3.38	+
Eating dinner	5	4.3	10.84	+14.1	5	1.4	7.56	+ 9.2
Going out	4	6.2	5.99	+ 5.1			3.24	+
Listening to music	3	7.4	11.94	- 5.3	4	1.4	6.54	- 3.0
Playing games			2.41	+			2.59	+
Practicing/lessons	7	3.3	7.98	+ 3.3			2.03	+
Reading books	2	15.6	37.64	+ 8.1	3	3.4	20.90	+ 5.1
Reading comics			1.00	+			3.56	+
Reading mail	6	3.3	7.07	- 5.7			2.35	-
Reading newspapers and magazines			0.49	-			0.03	+
Talking on phone	8	1.7	4.25	- 3.0			0.14	-
Watching television			2.18	-			2.27	-
Working on hobby			0.47	+			0.49	+
Constant		- 16.3				- 27.7		
Multiple *R*		0.65				0.81		
Total variance explained		42%				66%		

fifth-grade reading proficiency. The effects associated with school have been partialed out, because, as already explained, the data sets for the two schools are incommensurate. The columns under the heading *Status* display correlations with the tests administered during the middle of the fifth grade, just before the children began completing the activity forms. The columns under the heading *Growth* display the correlations of the time variables with the measures of fifth-grade reading proficiency after Grade 2 reading level has been partialed out. This method of representing the influence of out-of-school activities on reading growth was chosen because, unlike in residual gain scores, the influence is expressed in terms of the readily understandable metrics of the fifth-grade tests.[2]

Table 5 presents regression analyses predicting fifth-grade reading comprehension percentile and growth in reading comprehension percentile from the second to the fifth grade as a function of the transformed time variables. Variance associated with school was removed first. In the growth analysis, the variance attributable to second-grade reading percentile was removed next. Then the variables representing the time spent in activities were entered in stepwise fashion until there was no unentered variable that would account for significant (alpha = .05) additional variance. In order to determine whether there was a better model of the data than the one produced by the stepwise method, all possible models that involved entering the same number of variables were examined; none was found that produced a larger squared multiple correlation coefficient.

The column in Table 5 labeled *Final F* presents tests of the significance of the regression coefficients at the step at which the analysis terminated. Likewise, the column labeled

Table 6 Regression of fifth-grade vocabulary on log minutes per day spent in out-of-school activities

Variable	Fifth-grade status				Second/fifth growth			
	Order of entry	% of var.	Final *F*	Final *B*	Order of entry	% of var.	Final *F*	Final *B*
School	1	4.0	2.33	- 4.5	1	4.5	0.02	- 0.4
Second-grade reading					2	43.4	119.16	+0.6
Doing chores	8	2.1	4.93	- 2.9			2.26	-
Doing homework			0.11	-			0.21	+
Eating dinner	5	4.5	13.50	+13.40			3.22	+
Going out			1.99	+			1.34	+
Listening to music	4	6.4	13.50	- 4.9			1.05	-
Playing games	7	2.3	5.11	+ 2.8			3.33	+
Practicing/lessons	3	5.2	7.70	+ 2.9			2.71	+
Reading books	2	10.0	17.97	+ 4.9			2.75	+
Reading comics			1.86	+	3	1.8	4.87	+2.7
Reading mail	6	4.5	7.69	- 5.0			2.71	-
Reading newspapers and magazines			1.02	+			0.81	+
Talking on phone			1.72	-			0.10	+
Watching television			1.66	-			0.45	-
Working on hobby			1.17	+			0.11	+
Constant		30.1				25.1		
Multiple *R*		0.63				0.71		
Total variance explained		39.1 %				49.7 %		

Final B gives unstandardized regression coefficients from the last step in the analysis. Each coefficient expresses the change in reading comprehension percentile attributable to a one-unit change in the predictor; in the case of the time variables, these are unit changes on the scale of log (m + .5). For each variable that did not enter the analysis, we present the F value and the sign of the regression weight which would have been observed if the variable had entered at the next step.

Tables 6 and 7 summarize comparable stepwise analyses predicting fifth-grade vocabulary and fifth-grade reading speed. The analysis of percentage of vocabulary words known is identical in conception to the analysis of comprehension. In the case of reading speed, six orthogonal contrasts coding classroom were entered instead of school. This was done because the speed measure was quite labile, probably because performance was influenced by the classroom climate during the administration of the test. All possible models predicting vocabulary and speed using the same number of variables as the models produced by the stepwise method were examined to discover whether there were any that explained more variance, but none was discovered.

In each of the foregoing analyses predicting comprehension, vocabulary, and speed, all of the possible interactions of children's gender and second-grade reading level with the time they allocated to the various out-of-school activities were also explored. None was significant.

Finally, Table 8 summarizes an analysis of time spent reading books as a function of teacher, second-grade reading level, gender, and the amount of time reported in other out-of-school activities. The most newsworthy finding

Table 7 Regression of fifth-grade reading speed on log minutes per day spent in out-of-school activities

	Fifth-grade status				Second/fifth growth			
Variable	Order of entry	% of var.	Final *F*	Final *B*	Order of entry	% of var.	Final *F*	Final *B*
Teacher	1	19.5			1	19.7		
Second-grade reading					2	13.5	19.57	+ 0.8
Doing chores			2.92	-	5	2.0	4.37	- 8.1
Doing homework			0.86	-			1.55	-
Eating dinner			1.58	+			0.92	-
Going out			1.31	+			0.56	-
Listening to music			0.71	-			0.73	-
Playing games			1.87	+			0.29	+
Practicing/lessons			3.25	+			0.74	+
Reading books	2	8.8	20.68	+15.8	4	2.3	6.92	+ 9.9
Reading comics			0.67	+			0.41	+
Reading mail			1.24	+			0.66	+
Reading newspapers and magazines			3.21	+	3	3.6	7.25	+10.5
Talking on phone	3	3.2	6.47	- 9.1			3.25	-
Watching television			1.66	+			1.11	+
Working on hobby			1.18	+			0.44	+
Constant		166.1				114.8		
Multiple *R*		0.56				0.64		
Total variance explained		31.6 %				41.1 %		

Table 8 Regression of log minutes per day spent reading books on log minutes per day spent in other out-of-school activities

Variable	Order of entry	% of var.	Final *F*	Final *B*
Teacher	1	11.1	6.81	
Second-grade reading	2	8.9	16.65	+0.02
Gender	3	3.5	4.46	- 0.41
Doing chores	4	5.7	7.89	+0.23
Doing homework	5	3.7	8.51	+0.29
Eating dinner			1.64	-
Going out			0.15	-
Listening to music			0.16	+
Playing games			0.77	+
Practicing/lessons			0.63	+
Reading comics	6	3.4	7.02	+0.24
Reading mail			0.45	+
Reading newspapers and magazines			0.50	+
Talking on phone			1.82	+
Watching television			3.20	-
Working on hobby			0.70	+
Constant		- 0.12		
Multiple *R*		0.60		
Total variance explained		36 %		

is that the teacher has a significant influence on the amount of book reading children do out of school. The influence is substantial; the class that read the most averaged 16.5 minutes per day, whereas the class that read the least averaged only 4.1 minutes per day.

The fact that the teacher is a major influence on children's reading means that, because of the way this study was done, the analyses presented so far may give a conservative view of the relationship between amount of book reading and reading proficiency. The reason is that the practices of a fifth-grade teacher will have had only a limited opportunity to influence reading proficiency by the middle of the year. In fact, when the influence of the teacher is partialed out, the correlation of amount of book reading with reading comprehension percentile rises from +.39 to +.41, and the correlation with vocabulary rises from +.32 to +.36. (The influence of the teacher has already been accounted for in the analysis of reading speed shown in Table 7.)

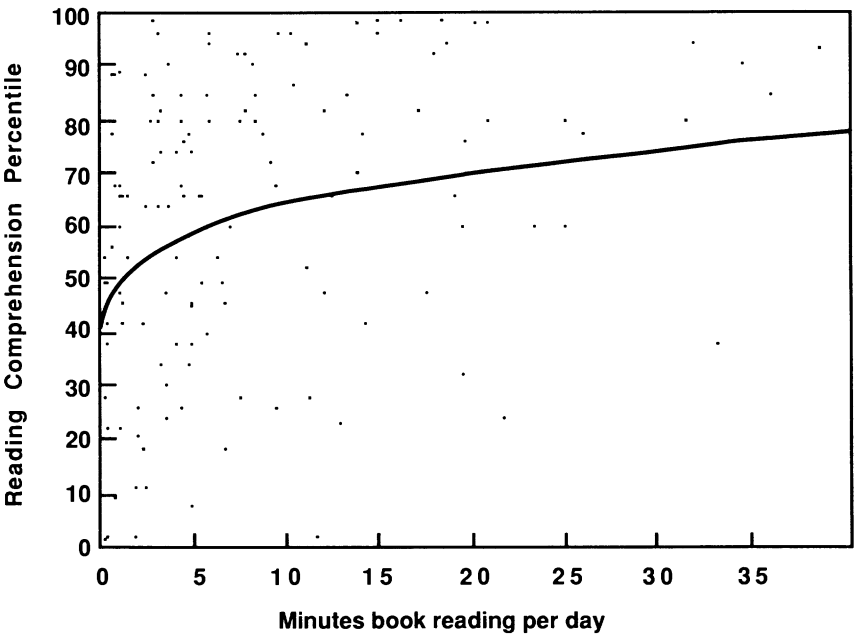
One purpose of the analysis summarized in Table 8 was to see whether other activities compete with book reading. Although watching television had a nearly significant negative relationship, there was no strong evidence that any out-of-school activity interfered with book reading. In fact, small but significant positive associations were uncovered between amount of book reading and doing chores, doing homework, and reading comic books. Children who were good readers in the second grade did more reading in the fifth grade. Girls read more than boys. There were no effects on book reading from interactions between activities and second-grade reading level or gender.

Discussion

This study revealed truly staggering differences between children in amount of out-of-school reading. The wide variation is evident on every measure summarized in Table 3. Notice that most children do little reading, while successive groups of children read for increasingly long periods of time and cover increasingly large numbers of words. For instance, the child who is at the 90th percentile in amount of book reading spends nearly five times as many minutes per day reading books as the child at the 50th percentile, and over two hundred times as many minutes per day reading books as the child at the 10th percentile.

The study suggests that teachers have an important influence on how much time children spend reading books during after-school hours. The class that did the most reading read 3.6 times as much on the average as the class that did the least reading, after discounting differences in second-grade reading level and proportions of boys and girls. Among the things teachers do to promote reading are assuring access to interesting books at a suitable level of difficulty, using incentives to increase motivation for reading, reading aloud to children, and providing time for reading during the school

Figure 1
Reading comprehension percentile as a function of minutes per day reading books



day (for a more complete discussion, see Fielding, Wilson, & Anderson, 1986).

Reading books was the out-of-school activity that proved to have the strongest association with reading proficiency. Time spent reading books was fairly strongly associated with the measures of a child's status as a reader in the fifth grade. More interesting, and important, is the fact that time spent reading books was the best predictor of a child's growth as a reader from the second to the fifth grade. After accounting for the child's second-grade reading level, each log unit increase in book reading time reported in the fifth grade was associated with a 4.9 percentile gain in reading comprehension, a 2.6 percent gain in vocabulary words known, and a 12 WPM gain in reading speed.

The relationship between fifth-grade reading comprehension percentile and amount of time spent reading books is graphed in Figure 1. The function is superimposed on a scatterplot of the individual cases in order to give an impression of the goodness of fit of the function and the dispersion of cases around the function. The figure shows that reading comprehension rises sharply between 0 and about 10 minutes a day of book reading and then levels off. It might be supposed that the best interpretation of the relationship graphed in Figure 1 is that those who can read do, and those who can't don't. However, this interpretation provides a poor account of the data; a model in which children who did any book reading at all were coded 1 (= Readers) and those who did no book reading were coded 0 (= Nonreaders) explained relatively little variance in reading comprehension. Significantly more variance was explained when a straight line was fit through the full range of reading times. This means that gradations in amount of book reading (beyond no reading at all) make a difference in reading proficiency. Furthermore, the log function pictured in Figure 1 explained significantly more variance than a straight line. This suggests that time

invested in reading yields big returns in reading proficiency at first, but there are diminishing returns as more and more additional time is invested.

The findings of this investigation with respect to book reading are comparable to the findings of other investigations (e.g., Greaney & Hegarty, 1984; Long & Henderson, 1973). Notably, the findings are similar to those of two recent investigations with large samples and complete descriptions of methods and data.

The first is the study by Greaney (1980), who also reported that the distribution of book reading time was highly skewed. Fully 44% of the Irish school children he studied did not read books on any of the 3 days they completed diaries. At the other extreme, 6.4% of the pupils devoted at least an hour a day of their leisure time to book reading. Greaney applied a logarithmic transformation to the time variables. Presumably this normalized the distributions of times and linearized the relationships with reading achievement, but no corroborating evidence was provided. Greaney reported a correlation of +.31 between the logarithm of book reading time and a measure of reading achievement.

The findings of the investigation described in this paper are also similar to those of Walberg and Tsai (1984). When the American children they studied were asked how much time they had spent reading for enjoyment yesterday, 44% marked "none," whereas only 5% indicated 3 hours or more; thus, the distribution was very skewed. Walberg and Tsai found that frequency and amount of reading had logarithmic relationships to reading achievement. The correlations of the logarithm of reading time with reading achievement were +.18 for frequency of reading and +.10 for amount of time spent reading.

Most of the variability between these studies in the size of the correlation found between time spent reading books and reading proficiency is probably attributable to differences in reliability of measurement. The most reliable measurement of reading time was obtained in the present study, in which children filled in activity forms for a median of 57 days. Next most reliable was the Greaney measure. Based on the intercorrelations (furnished by Greaney in a personal communication) between the book reading times reported on the 3 days children completed diaries, the estimated reliability of his measure was .68. This compares with an estimated reliability of .86 (as reported earlier) for the measure of book reading time obtained in the present study. If the correlations of book reading time with reading proficiency observed in the two studies are corrected for attenuation due to unreliability of the measures of book reading time, the figures for the two studies are quite close, +.42 for the present study and +.38 for Greaney's study.

Much less reliable, presumably, were the answers to the single questionnaire items analyzed by Walberg and Tsai. Although we don't know what these reliabilities actually were, it is reasonable to suppose that the corrected coefficients would be in the vicinity of the ones obtained in the present study and the Greaney study. Hence, the evidence appears to converge, and the following conclusion seems warranted: There is a moderately strong association between out-of-school reading and reading achievement, a relationship of about the same magnitude as the strongest relationships reported with in-school use of time (Barr & Dreeben, 1983; Rosenshine & Stevens, 1984).

These studies also provide tolerable convergence on the absolute amount of reading done each day by the typical child. The variability that does exist between the studies could reflect real differences between American fifth- and seventh-grade students or between American and Irish children. It is tempting, though, to dismiss the variability as merely reflecting differences in the way reading was broken into categories, the way questions were phrased, and the way data were collected and analyzed.

Greaney (personal communication) lumped magazines together with books and put newspapers into a separate category, whereas we kept books separate and lumped magazines with newspapers. If we pool books, magazines, and newspapers, Greaney's study shows mean reading time at 18.2 minutes per day; our study shows 14.8 minutes per day.[3] Our figure reflects just the instances in which the children re-

ported the author, title, or—in the case of magazines and newspapers—the topic of the selection. When all reported reading of books, magazines, and newspapers is counted, mean reading time per day rises to 15.5 minutes. Greaney's sample was representative of Irish school children, whereas our sample was somewhat above average for American school children. Furthermore, Greaney found a mean of 8.2 minutes per day reading comic books, whereas we found only 2.1 minutes. Therefore, it does appear that the typical Irish child in the middle grades may spend more time reading than the comparable American child.

Walberg and Tsai found that the median child reported reading about 1 day out of 5, an outcome similar to ours. However, with respect to amount of time spent reading, if one leans on the assumption that the distribution underlying the answers was log-normal, then it would be estimated that the median child in the Walberg and Tsai sample read 7.2 minutes per day. This compares with the higher median in the present study of 12.9 minutes per day for all out-of-school reading (see Table 3). The apparent difference between the two studies may be attributed to the fact that Walberg and Tsai's sample was less able (but more representative) than ours, or that their question was restricted to reading for enjoyment, whereas ours included all reading, whether done for enjoyment or not. On the other hand, Walberg and Tsai necessarily accepted whatever reading the child reported, whereas we counted reports of reading only when the child could list the author, title, or topic.

Hence, a close reconciliation of the data from the three studies on the absolute amount of reading is not possible. Nonetheless, it can be confidently concluded that the typical child in the middle grades reads less than 25 minutes a day out of school. The amount appears to be considerably less than this in the United States, maybe as little as 8-12 minutes per day when all types of reading material are included, and maybe as little as 4-5 minutes a day when only books are counted. The amount of reading is almost certainly much lower than many have supposed (e.g., Feeley, 1973; Heyns, 1978; Medrich, Roizen, Rubin, & Buckley, 1982; Witty, 1965).

Does reading, particularly book reading, cause growth in reading proficiency? The fact that book reading was a significant predictor of growth suggests that the answer is yes. Notice that it could be argued that, if anything, the present investigation underestimates the causal force of out-of-school reading, because time devoted to reading was assessed after the period during which the growth occurred. It stands to reason that if time devoted to reading had been assessed throughout the period of growth, its association with growth in proficiency would have been stronger.

A causal attribution that depends upon correlational analysis, as does the present one, is never completely trustworthy. One worry is that the second-grade reading proficiency measure was less reliable than the fifth-grade measure. If this were so, the role of amount of book reading in reading growth would have been exaggerated.

According to the usual ways of reckoning, a factor such as amount of book reading would be given credit as a causal force only to the extent that it explained unique variance in the criterion measure. In the present case, before considering other factors, amount of book reading explains 14.4% of the variance in fifth-grade reading comprehension. However, 7.8% is covariance shared with second-grade reading level, a figure that might rise if the possibly lesser reliability of the second-grade measure could be considered. Thus, at most, 6.6% of the variance in fifth-grade reading comprehension is uniquely explained in terms of amount of reading.

However, in this case, we are inclined to reject the usual assumptions of causal modeling founded on intercorrelations. Giving priority to second-grade reading level when attempting to explain fifth-grade reading level is like treating the child's mind as a ballistic missile, set into motion by the genes and early childhood experience, whose trajectory is unaffected by later experience. More reasonable is the assumption that second-grade level gets translated into fifth-grade level through a cascade of intervening

events, including the reading a child does. In other words, engaging in the act of reading should be regarded as a proximate cause of growth in reading ability, and it ought to have a claim to the covariance shared with distal causes such as second-grade level.

Experimental evidence on the value of reading books—which, of course, when it is feasible, is the best way to establish that one factor is a cause of another—comes from evaluations of "book floods." Striking evidence was obtained by Elley and Mangubhai (1983), who placed libraries of English storybooks in the classrooms of Fiji children. The children made much larger gains on achievement tests than children in comparison classrooms, an advantage that continued to appear on several measures over a period of years. These findings might be discounted, though, on the grounds that the children, who were not native speakers of English, and who were being taught by the notorious audiolingual method, otherwise would have had almost no opportunity to hear and read interesting, natural English. A book flood with native English-speaking children produced positive but less dramatic results (Ingham, 1981).

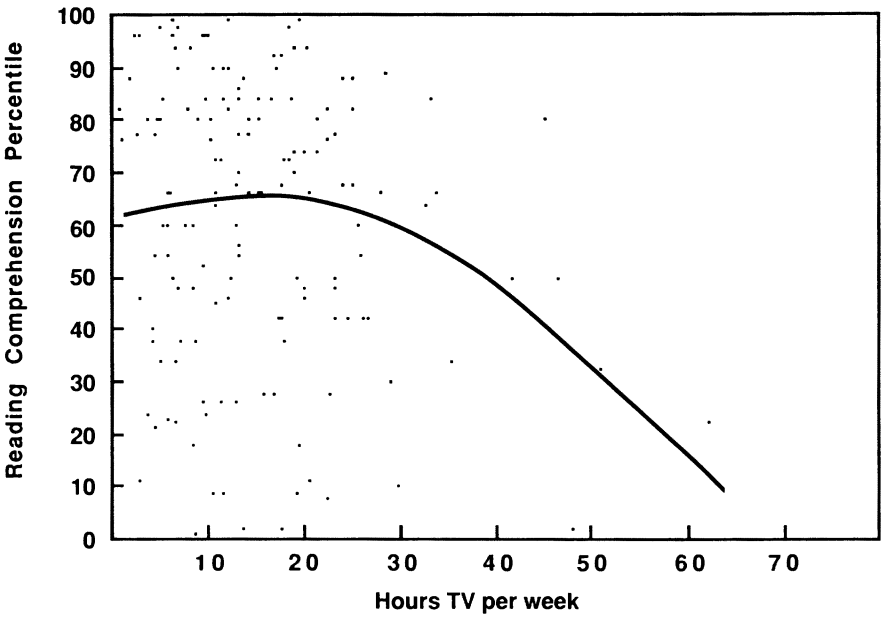
Other interventions intended to increase amount of book reading have had mixed results. The trend in the United States has been to follow McCracken's (1971) model of Sustained Silent Reading. Gambrell (1978) and Hong (1981) present two of several good practical papers on how to implement sustained silent reading in the classroom. Most of the literature, in fact, has been practical. Moore, Jones, and Miller (1980) lament the lack of persuasive research on sustained silent reading. They conclude in their review that the practice tends to improve student and teacher attitudes; however, they also find that the evidence of any influence on student achievement is thin.

Among the studies of sustained silent reading that appear to have been well designed and executed is one by Cline and Kretke (1980), who evaluated a 3-year-long junior high school program in Boulder, Colorado. The students in the school with the reading program developed significantly more positive attitudes about reading books of their own choice, going to the library, and the importance of reading. Collins (1980) reported an experiment with matched classrooms from the second through the sixth grade. The students who did sustained silent reading moved faster through their basal readers. Furthermore, they showed no decline in spelling and English test scores even though they gave up as much as a half an hour per day of instruction in spelling and English for silent reading. Manning and Manning (1984), in the only study to compare different approaches for increasing children's amount of reading, carried out a year-long project with 24 fourth-grade classes. They found that approaches that emphasized peer interaction and individual teacher-student conferences produced significantly better attitudes than the control condition and the traditional sustained silent reading approach. In addition, the peer interaction approach produced significant gains on a reading achievement test.

Thus, interventions to increase amount of book reading often have desirable effects, but studies of these interventions are so far not completely convincing. One general observation can be made about almost all of this research: Nobody measures the amount of reading, even at the group level, nor does anyone explicitly relate amount of reading to changes in reading achievement at the individual level. Hence, the really penetrating research remains to be done. Our conjecture is that well-designed evaluations of sensible interventions to increase amount of book reading would consistently show fairly strong results.

Turning now to other out-of-school activities, time spent eating dinner had positive relationships with reading proficiency in the fifth grade and growth in reading proficiency from the second to the fifth grade. One possible explanation for this fact is functional: Dinner time provides occasions for discussions with parents and others, and thereby promotes language development. Another possible explanation is that time eating dinner is a social indicator: Spending more time eating dinner may mean a greater likelihood of a two-parent family, greater family stability, or a stronger commitment to joint fam-

Figure 2
Reading comprehension percentile as a function of hours per week watching television



ily activities. There are no clues in the present data that suggest a choice between these explanations.

Some sort of social-indicator explanation provides the most plausible account of the negative relationships between time spent doing chores and the measures of reading proficiency. Maybe the child from a single-parent family more often is called upon to look after younger brothers and sisters, or possibly the poor child more often has to deliver newspapers or do farm chores. This picture is blurred by the fact that time spent doing chores had a significant positive relationship with amount of book reading.

Listening to music was another negative predictor of reading proficiency. One might conjecture that it is the less active child who spends extreme amounts of time listening to music. Contrary to popular opinion, "bookworms" tend to be active children. They do not, in Greaney's (1980) picturesque phrase, spend much time "lying about." Greaney found a significant negative relationship between empty hours and amount of reading.

Watching television had a small negative relationship with measures of reading proficiency in the present study. Williams et al. (1982), in their comprehensive synthesis of the research on television viewing and school achievement, found that achievement rises slightly up to about 10 hours a week of viewing, then falls sharply, and finally levels off, as the number of hours per week of viewing increases. We took their finding as a warrant to fit a third-degree polynomial to our TV viewing and reading comprehension data. This is the simplest function that could reproduce the Williams et al. finding, though it should be cautioned that only the linear component accounted for significant variance. Figure 2 shows the function superimposed on a scatterplot of the individual cases. As can be seen, the results are in close agreement with the Williams et al. synthesis. The one difference is that the function fit to the

data from this study did not level off as the number of hours a week of viewing became extreme, but only 10% of the children from this study watched as many as 25 hours of TV a week.

In the analyses reported so far, doing homework has shown small, nonsignificant relationships with the measures of reading proficiency. But these analyses underestimate the value of homework, because there was wide variation between classes in the average amount of homework reported, ranging from 12.9 to 32.6 minutes per day. Probably this variation is attributable to such factors as the amount of homework teachers assigned, the perceived interest and value of the assignments, and the perceived consequences of not completing assignments. Notice, however, that homework being done in the fifth grade could have only a limited opportunity to influence performance on tests given in the middle of the fifth grade or, particularly, growth from the second to the fifth grade. Therefore, variation between fifth-grade classes in amount of time being spent on homework could have obscured persisting benefits from homework. In fact, when between-class variation was removed, amount of time spent on homework had a significant influence on growth in reading comprehension from the second to the fifth grade. Homework enters the equation after book reading and listening to music, final $F = 5.07$, final $\beta = +3.48$, $p < .05$, 1.8% of variance predicted. When the data are analyzed in this way, doing homework is being treated as a persistent behavior tendency which depends, no doubt, on the motivation and discipline of the child, the press of the home, and the cumulative influence of previous teachers.

In sum, the principal conclusion of this study is that the amount of time a child spends reading books is related to the child's reading level in the fifth grade and growth in reading proficiency from the second to the fifth grade. The case can be made that reading books is a cause, not merely a reflection, of reading proficiency. Although this case falls short of being conclusive, it is as strong as the case for any other practice in the field of reading, in or out of school.

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Footnotes

[1]There were only two cases where a factor was significant in one analysis but not significant in the other: Talking on the phone and reading mail were significant negative predictors in the village school but not in the town school.

[2]Note, though, that correlations of time variables with residual gain scores are larger than correlations of time variables with posttest scores after pretest scores have been partialed out, even though essentially the same relationship is being expressed. For instance, in this study the correlation of the log of book reading time with second- to fifth-grade residual gain in reading comprehension percentile is +.38. The comparable partial correlation (see Table 3) is +.28.

[3]Means, rather than medians, which would have been preferred, are used in comparing Greaney's data with ours, because medians are not additive, and Greaney did not provide medians for all of the aggregates that need to be compared.

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