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Early Reading Acquisition and Its Relation to Reading Experience and Ability 10 Years Later

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A group of 1st-graders who were administered a battery of reading tasks in a previous study were followed up as 11th graders. Ten years later, they were administered measures of exposure to print, reading comprehension, vocabulary, and general knowledge. First-grade reading ability was a strong predictor of all of the 11th-grade outcomes and remained so even when measures of cognitive ability were partialed out. First-grade reading ability (as well as 3rd- and 5th-grade ability) was reliably linked to exposure to print, as assessed in the 11th grade, even after 11th-grade reading comprehension ability was partialed out, indicating that the rapid acquisition of reading ability might well help develop the lifetime habit of reading, irrespective of the ultimate level of reading comprehension ability that the individual attains. Finally, individual differences in exposure to print were found to predict differences in the growth in reading comprehension ability throughout the elementary grades and thereafter.

Within cognitive developmental psychology, there is a considerable literature on the individual differences in the cognitive processes that support efficient reading performance (Carr & Levy, 1990; Gough, Ehri, & Treiman, 1992; Perfetti, 1985, 1994; Share & Stanovich, 1995). The causal model that is implicit in such analyses locates individual differences in the cognitive subprocesses prior to reading ability. In recent years, however, interest has begun to focus on the reciprocal influence that exposure to print itself has on the development of cognitive processes and declarative knowledge bases.

There are two primary reasons why interest in the reciprocal influence of reading experience has been increasing. First, there is growing concern that the reciprocal influence of reading experience itself might contribute to the academic problems experienced by some children (Stanovich, 1986, 1993; Chall, Jacobs, & Baldwin, 1990). Second, there is the increasing recognition that exposure to print might need to be an important explanatory variable in theories of cognitive developmental change that emphasize the importance of domain knowledge (Ceci, 1990; Morrison, Smith, & Dow-Ehrensberger, 1995; Stanovich, 1993).

The former concern is exemplified in discussions of so-called *Matthew effects* in academic achievement (Stanovich, 1986; Walberg & Tsai, 1983)—rich-get-richer and poor-get-poorer mechanisms embedded in the social and cognitive contexts of schooling. For example, very early in the initial acquisition process, poor readers, who experience greater difficulty in breaking the spelling-to-sound code, begin to be exposed to much less text than their more skilled peers (Allington, 1984; Biemiller, 1977-1978). Further exacerbating the problem of differential exposure is the fact that less-skilled readers often find themselves in materials that are too difficult for them (Allington, 1977, 1983, 1984; Gambrell, Wilson, & Gantt, 1981). The combination of deficient decoding skills, lack of practice, and difficult materials results in unrewarding early reading experiences that lead to less involvement in reading-related activities. Lack of exposure and practice on the part of the less-skilled reader delays the development of automaticity and speed at the word recognition level. Slow, capacity-draining word recognition processes require cognitive resources that should be allocated to higher-level processes of text integration and comprehension (LaBerge & Samuels, 1974; Perfetti, 1985; Stanovich, 1980). Thus, reading for meaning is hindered, unrewarding reading experiences multiply, and practice is avoided or merely tolerated without real cognitive involvement.

The differential reading experiences of children of varying skill may have many other consequences for the children's future reading and cognitive development. As skill develops and word recognition becomes less resource demanding by taking place through relatively automatic processes, more general language skills become the limiting factor on reading ability (Chall, 1983; Sticht, 1979). But the reading experience of the better reader has the potential to provide an advantage even here if—as previous research (Echols, West, Stanovich, & Zehr, 1996; Stanovich &

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Cunningham, 1992, 1993) and the present study will suggest—exposure to print serves to develop processes and knowledge bases that facilitate reading comprehension (vocabulary, familiarity with complex syntactic structures, etc.). From the standpoint of a reciprocal model, such effects imply that many cognitive differences observed between readers of differing skill may in fact be consequences of differential practice that itself resulted from early differences in the speed of initial reading acquisition. The increased reading experiences of children who master the spelling-to-sound code early (see Adams, 1990) thus might have important positive feedback effects that are denied the slowly progressing reader. In some previous research (described below), we have begun to explore these reciprocal effects.

The second important theoretical motivation for this research program is provided by theories of cognitive development that have strongly emphasized the importance of domain knowledge (Alexander, 1992; Bjorklund, 1987; Ceci, 1990, 1993; Chi, 1985; Chi, Hutchinson, & Robin, 1989; Hoyer, 1987; Keil, 1984; Scribner, 1986). Given that the knowledge dependency of cognitive functioning is a central tenet of many contemporary developmental theories, it is surprising that there has not been more attention directed to a question that such theories seem to naturally prompt: Where does knowledge come from? This question seems to be addressed only implicitly by theories emphasizing knowledge dependency—the most common implication being that individual differences in domain knowledge are, for the most part, a product of experiential differences. In contrast, some investigators have explicitly argued against the experiential assumption implicit in the domain knowledge literature. These alternative hypotheses can be illustrated with vocabulary knowledge as an example.

Vocabulary is a knowledge base that is important for many aspects of psycholinguistic processing, and it is certainly tempting to attribute variability in vocabulary size to experiential differences. For example, there is considerable evidence indicating that children's vocabulary sizes are correlated with parental education and indicators of environmental quality (Hall, Nagy, & Linn, 1984; Mercy & Steelman, 1982; Wells, 1986). Thus, it has been argued that vocabulary differences are primarily the result of differential opportunities for word learning. In contrast, proponents of what one might call the cognitive efficiency hypothesis have argued that experiential factors are not implicated—or at least are of secondary importance—in explaining vocabulary differences. For example, Jensen (1980) has argued that

> Children of high intelligence acquire vocabulary at a faster rate than do children of low intelligence, and as adults they have a much larger than average vocabulary, not primarily because they have spent more time in study or have been more exposed to words, but because they are capable of educing more meaning from single encounters with words. . . . The vocabulary test does not discriminate simply between those persons who have and those who have not been exposed to the words in context. . . . The crucial variable in vocabulary size is not exposure per se, but conceptual need and inference of meaning from context. (pp. 146–147)

It is important to realize that cognitive efficiency explanations of this type are generic and are not necessarily restricted to the domain of vocabulary acquisition. They could, in theory, apply to knowledge acquisition in virtually any domain. Ceci (1990) has discussed how, in an attempt to undermine developmental theories that emphasize the importance of knowledge structures in determining intelligent performance, advocates of the cognitive efficiency hypothesis have argued that "intelligent individuals do better on IQ tests because their superior central-processing mechanisms make it easier for them to glean important information and relationships from their environment" (p. 72). The cognitive efficiency hypothesis thus undercuts all developmental theories that emphasize the importance of knowledge structures in determining intelligent performance by potentially trivializing them. According to the cognitive efficiency view, these differences in knowledge bases may affect certain cognitive operations all right, but the knowledge differences themselves arise merely as epiphenomena of differences in the efficiency of more basic psychological processes. Knowledge differences thus become much less interesting as explanatory mechanisms of developmental differences because they are too proximal a cause.

We have suggested that one of the most powerful experiential determinants of individual differences in vocabulary and declarative knowledge is exposure to print (Stanovich, 1993). The empirical demonstration of this conjecture is fraught with difficulties, however. This is because any zero-order correlation between literacy experience and a cognitive variable is ambiguous because there are any number of third variables that might be mediating a spurious relationship (see Guthrie & Greaney, 1991; Guthrie, Schafer, & Hutchinson, 1991; Scribner & Cole, 1981; Stanovich, 1993; Wagner, 1987).

In a series of studies, these interpretative difficulties were addressed by examining whether the relationship between exposure to print and various cognitive outcomes can be demonstrated to have a specificity extending beyond the more obvious third variables. For example, exposure to print has been shown to be related to spelling ability, even when differences in decoding ability have been partialed out (Cunningham & Stanovich, 1990, 1991; Stanovich & West, 1989). Likewise, exposure to print has been shown to account for variance in vocabulary and declarative knowledge, even after individual differences in general cognitive ability have been partialed out (Stanovich & Cunningham, 1992, 1993; West & Stanovich, 1991). Finally, print exposure has been found to predict differences in vocabulary and knowledge, even in samples of adults that have been statistically equated for years of education (Stanovich, West, & Harrison, 1995; West, Stanovich, & Mitchell, 1993).

The present study is an attempt to extend the conclusions of those earlier investigations by reporting a unique longitudinal study that fills a gap in the earlier literature. Most of the studies cited above involved assessing contemporaneous correlations. However, in one investigation (Cipielewski & Stanovich, 1992; see also Echols et al., 1996), a particular aspect of the logic of measures of print exposure was exploited. In that study, measures of exposure to print and measures of reading comprehension were administered to groups of fifth-grade children. The third-grade reading comprehension scores of these children were also available, thus making it possible to study growth in comprehension ability from third to fifth grade. Although print exposure was not measured directly in the third grade, presumably

the variance in the exposure indicators in fifth grade reflects not only variance at the time of testing but also variance occurring during early years as well. Therefore, the fifth-grade measures were regarded as somewhat retrospective indicators assessing the cumulative experiences that had occurred several years previously and up to the time of testing. That this interpretation of the print exposure indicators was justified is supported by the finding that the print exposure measures administered in the fifth grade were able to predict the growth in reading comprehension ability from third to fifth grade.

In the present study, this logic was extended even further by examining the performance of a sample of students who had been tested as 1st graders (see Stanovich, Cunningham, & Feeman, 1984). About one half of this sample were available 10 years later for testing as 11th graders. At that time, a set of reading comprehension, cognitive ability, vocabulary, and general knowledge tasks, as well as several measures of exposure to print, were administered. In addition, some standardized test scores from the intervening period were available. We were thus able to examine what variables in the 1st grade predicted these cognitive outcomes in the 11th grade. Also, in some analyses, the print exposure measures administered in the eleventh grade were interpreted as cumulative indicators of variance in reading volume that had taken place many years earlier. Thus, the measures were viewed as, in some sense, retrospective indicators tapping the cumulative experiences and habits of the students some distance in time before actual assessment. In this study, we were able to examine how far this retrospective feature could be stretched.

In a final set of analyses, the analytic logic was reversed and exposure to print in the eleventh grade was treated as a criterion variable to examine which cognitive variables measured in the first grade could predict it. Importantly, the question of whether the speed of initial reading acquisition in the first grade could predict later tendencies to engage in reading activities was addressed, even after differences in general cognitive abilities were controlled—as some models of Matthew effects in educational achievement would predict (Chall et al., 1990; Juel, 1994; Stanovich, 1986).

Method

Participants

Fifty-six first-grade children (32 boys and 24 girls) were recruited from two classrooms in a predominantly middle-class elementary school. Their mean age in May of that year was 7 years 1 month. The children received a reading program consisting of a basal series (Harcourt, Brace, Jovanovich, 1979), phonics program with a workbook (Modern Curriculum Press, 1970), and a spelling and writing program developed by their teachers.

Ten years later, 27 eleventh-grade students (15 boys and 12 girls) remained in the school district for follow-up testing. The mean age (in February) of the 11th graders was 16 years 9 months (range 16 years 4 months to 18 years 2 months). The 27 students who were available for testing did not differ significantly from the 29 students who were not available for testing on any first-grade task.

First-Grade Tasks

Although a variety of tasks were administered to the first-grade children, this study was focused on standardized measures of reading and cognitive ability.

Cognitive Ability

The Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981) and the Raven's Coloured Progressive Matrices (Raven, 1962) were administered to the children. The PPVT is an oral receptive vocabulary measure sometimes used as an index of general cognitive ability. The Raven matrices taps general problem-solving skills and is commonly viewed as a good measure of analytic intelligence (Carpenter, Just, & Shell, 1990). A 60-min time limit was used, and the raw scores were used in the analyses that follow.

Reading Ability

The children were administered the Reading Survey test of the Metropolitan Achievement Test (MAT; Form JS, Primary I; *Metropolitan Achievement Tests—Primary,* 1978). The Reading Survey of the MAT assesses reading comprehension and does not directly test word decoding. That is, no direct tests of word analysis skills enter into the total score. Because the percentile scores on the MAT were available from the school files for these children in the 3rd, 5th, and 10th grades, the percentile scores from the 1st-grade sample were also used.

The children also completed the Comprehension subtest of the Gates–MacGinitie Reading Tests (Form 2, Primary Level A; *Gates–MacGinitie Reading Tests (Primary Level A,* 1978), which is designed to assess Grade Levels 1.5 to 1.9. The Comprehension subtest consists of 40 single and short three-to-four sentence passages accompanied by four pictures. The child's task is to choose the picture that best illustrates the passage or that answers a question about the passage. Finally, the Wide Range Achievement Test (WRAT; Jastak & Jastak, 1978) was individually administered to the children in sessions that lasted approximately 10 min. Level 1 consists of 25 letters and a series of individual words increasing in difficulty. The child was instructed to look at each word carefully and read it aloud. The first time an error was made, the child was asked to read the word again. If the child self-corrected, the answer was scored correctly. The child was given 10 s to respond to each word. Testing was ended when the child made three consecutive errors. The child received 1 point for each correctly read letter and word, for a maximum score of 100. Raw scores were used for the analyses. The raw score on the Gates and the WRAT were used in the analyses that follow.

Eleventh-Grade Tasks

Reading Comprehension

Students completed the Comprehension subtest of the Nelson–Denny Reading Test (Form F; Brown, Bennett, & Hanna, 1981). To cut the administration time from 20 min to 14 min, the long initial passage of Form F (lengthened to allow assessment of reading rate) and the last passage were omitted, along with their 12 questions. Students thus completed six of the eight passages and answered the 24 questions associated with those six passages. The split-half reliability of this shortened version of the test (.73, Spearman-Brown corrected) was not appreciably different from the alternate-form reliability of .77 reported in the test manual, according to Brown et al. Raw scores were used in the analyses that follow.

Written Vocabulary

Students completed 41 items chosen from Form F of the Vocabulary subtest of the Nelson–Denny Reading Test (Brown et al., 1981). To complete the test, the participant must read an incomplete sentence containing the key vocabulary word and then choose from among five written alternatives which word or short phrase correctly completes the sentence (e.g., Militant persons are usually [a] hopeless, [b] fearful,

[c] strengthened, [d] matter-of-fact, [e] aggressive). The students were given 10 min to complete the 41 items on the test. The split-half reliability of the measure (Spearman-Brown corrected) was .90. Raw scores were used in the analyses that follow.

Peabody Picture Vocabulary Test

Students were group administered 20 items chosen from Form L of the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981). Each participant had their own booklet of picture alternatives. The students looked at four picture alternatives while the experimenter said a word out loud. Their task was to choose one of the four pictures that best described the meaning of the word and to write down the number of the picture on a separate score sheet. The 20 PPVT items ranged in number on Form L from 150 to 174. The split-half reliability of the measure (Spearman-Brown corrected) was .64. Raw scores were used in the analyses that follow.

Raven's Matrices

Students completed 18 problems from Raven's Advanced Progressive Matrices (Set II, Raven, 1962). By eliminating 12 of the easiest problems, in which performance in a college sample is near ceiling (Carpenter et al., 1990; Raven, Court, & Raven, 1977), and 6 of the most difficult problems, in which performance is nearly floored (Carpenter et al., 1990; Raven et al., 1977), we tried to achieve a cut-time version of the advanced matrices that would still have adequate reliability and discriminating power. The split-half reliability of our 18-item measure was .60 (Spearman-Brown corrected). Raw scores were used in the analyses that follow.

Print Exposure Measures

Author Recognition Test. The Author Recognition Test (ART) was explicitly designed to circumvent the problem of questionnaire contamination by tendencies toward socially desirable responses (see Stanovich & West, 1989). The ART is a checklist in which the students indicate whether they are familiar with the name of a particular popular author by putting a check mark next to the name. There are 42 names of authors on this particular version of the ART. The participant is prevented from simply checking all of the names by the presence of foils—names of people who are not popular writers–authors. Fourteen foil names were interspersed randomly in the list.

The 42 authors appearing on the ART are listed in Appendix A, along with the percentage of times that the item was correctly checked. The version of the ART used in this investigation was adapted for a high school population by including several items not appearing on earlier adult versions that were designed for college age students. These were items designed to be more familiar to high school readers. The list is dominated by "popular" authors as opposed to "highbrow" writers who would be known by only the most academically inclined. Many of the book authors regularly appear on best-seller lists, and most have sold hundreds of thousands, if not millions, of volumes (see Stanovich & West, 1989; Stanovich & Cunningham, 1992, for sales statistics). Several of the authors were on the best-seller lists at the time the study was conducted.

Although no statistical sampling of authors was carried out, an attempt was made to mix authors from a wide variety of genres. Thus, most major categories of nonfiction (e.g., science, politics–current events, humor, religion, history, biography, business–finance, travel) and fiction (e.g., mystery–detective, romance–Gothic, spy–intrigue, occult–supernatural, historical novels, Westerns, short stories, and science fiction) were represented. In constructing the list, authors were selected who were most likely to be encountered outside of the classroom so that the ART would be a proxy measure of out-of-school print exposure. Thus, an attempt was made to avoid authors who are regularly studied in the school curriculum. None of the authors appears in Ravitch and Finn's (1987) survey of the high school literature curriculum. In short, the ART was intentionally biased toward out-of-school reading because it was intended as an indirect measure of free-reading volume. The 14 foils in the ART were names taken from the list of the Editorial Board of the *Journal of Educational Psychology* (Vol. 80, 1988). Full names were used in all cases except those in which the individual habitually used initials (e.g., S. E. Hinton).

On the response sheet that the students completed, this measure was labeled the "Author Recognition Questionnaire" and was referred to in this manner by the experimenter. The instructions to the participant read as follows:

> Below you will see a list of names. Some of the people in the list are popular writers (of books, magazine articles, and newspaper columns), and some are not. You are to read the names and put a check mark next to the names of those individuals whom you know to be writers. Do not guess, but only check those whom you know to be writers. Remember, some of the names are people who are not popular writers, so guessing can easily be detected.

These instructions resulted in very few foils being checked. Twenty-four students checked no foils, and 3 students checked one.

Scoring on the task was determined by taking the proportion of the target items that were checked and subtracting the proportion of foils checked. This is the discrimination index from the two-high threshold model of recognition performance (Snodgrass & Corwin, 1988). The reliability of the number of correct items checked was .92 (Cronbach's alpha). There was no time limit for completing the task, but it took most students less than 5 min.

Magazine Recognition Test. The logic and structure of the Magazine Recognition Test (MRT) was analogous to that of the ART, but it was designed to tap a possibly different type of out-of-school reading. Although the ART contains writers whose work sometimes appears in magazines and newspapers, it is nevertheless heavily biased toward authors of books. The MRT was thus designed to balance the ART by sampling magazine reading exclusively. This version of the MRT was designed for teenagers and, as such, taps more of the reading material for their age group. The 112 items on the MRT consisted of the names of 62 magazines and 50 foils. The 62 magazines appearing on this version of the MRT (see Appendix B) represent a sampling of titles deliberately biased toward popular teenage publications. The list also includes more of the high circulation publications than were included in earlier adult versions (e.g., *National Geographic, People, Reader's Digest*) as well as magazines targeted to teenagers, (e.g., *Hot Rod, Seventeen, Spin*). Although no statistical sampling of magazines was carried out, an attempt was made to attain a mix of genres. Thus, most major categories of publications (sports, current events, music, gossip, science, politics, humor, finance, homemaking, outdoors, fashion, technology, and cars) were represented. The 50 foil names (see Appendix C, Stanovich & West, 1989) did not appear in the 60,000 listings in the *Standard Periodical Directory* (Manning, 1988). The 112 names were listed in alphabetical order, mixing targets and foils.

On the response sheet that the students completed, this measure was labeled the "Magazine Recognition Questionnaire" and was referred to in this manner by the experimenter. The instructions for the MRT were as follows:

> Below you will see a list of 112 titles. Some of them are the names of actual magazines, and some are not. You are to read the names and put a check mark next to the names of those that you know to be magazines. Do not guess, but only check those that you know

> to be actual magazines. Remember, some of the titles are not those of popular magazines, so guessing can easily be detected.

These instructions resulted in only a few foils being checked. The mean number of foils checked per participant was 2.19. Scoring on the task was determined by taking the proportion of the correct items that were checked and subtracting the proportion of foils checked. The reliability of the number of correct items checked was .93 (Cronbach's alpha).

Our primary index of exposure to print was a composite variable that combined performance on the ART and MRT into a single measure (the two measures displayed a correlation of .77). For each participant, scores on the ART and the MRT were both converted to z scores. These two z scores were then averaged to form a composite index of print exposure as measured by these checklist tasks (hereinafter termed ARTMRTZ). Reliance on the recognition checklist measures as the primary index of exposure to print is empirically justified by the fact that these measures have been demonstrated to be more reliable and valid than questionnaire measures (Stanovich et al., 1995; Stanovich & West, 1989).

Activity Preference Questionnaire. The instructions for the Activity Preference Questionnaire were as follows:

> Below you will be given a choice between engaging in one of two activities. Please put a check mark next to the one that you prefer. Please mark only one. That is, even if you like both activities, please mark only the one you like better. Similarly, even if you dislike both activities, mark the one that you would prefer to do. For each item, please mark only one choice.

There followed 12 forced choices for the participant, in the following format: "I would rather (a) listen to music of my choice, or (b) watch a television program of my choice." Six of the questions concerned reading (the other 6 served as fillers to disguise the focus on reading). In these 6 items, "read a book of my choice" was pitted against "watch a television program of my choice," "play an outdoor sport of my choice," "listen to music of my choice," "talk with friends of my choice," "attend a movie of my choice," and "spend time on my hobbies." The participant's score on the task was simply the number of times that reading was chosen over one of these six activities. Scores thus ranged from 0 to 6. The mean score on the measure was 0.96 (SD = 1.6). Thus, the children reported that they would generally prefer these other activities to reading. Five of the items involved television as a choice, and scores for television choices were also calculated (M = 1.19, SD = 0.9).

General Knowledge Measures

Cultural Literacy Test. Students were administered a 45-item, multiple-choice cultural literacy test (CLT). Forty items were selected from Form A of the Cultural Literacy Test (Cultural Literacy, 1989), an instrument designed to assess the general cultural literacy of Grade 11 and 12 students. Seventeen of these items came from the science subsections ("Which of the following concepts is part of Darwin's theory of evolution?", "In what part of the body does the infection called pneumonia occur?", "Which of the following is a cause of acid rain?"), and 23 of the items came from the social sciences subsections (e.g., "Who was the American president who resigned his office as a result of the Watergate scandal?", "What is the term for selling domestic merchandise abroad?", "What is the term for the amount of money charged for a loan and calculated as a percentage of that loan?"). The remaining 5 questions were drawn from the survey of scientific literacy conducted by the the Public Opinion Laboratory of Northern Illinois University (Miller, 1989). There was a 12-min time limit on the task. The mean score on the task was 26.5 (SD = 6.9).

History and literature knowledge. Students were group administered a selection of 20 items from the National Assessment of Educational Progress test of high school history and literature knowledge (Ravitch & Finn, 1987). Ten items were selected from the history section (e.g., "Who was the leader of the Soviet Union when the United States entered the Second World War?" [a] Yuri Gagarin [b] Marshall Tito [c] Joseph Stalin or [d] Nikita Khrushchev) and 10 from the literature section (e.g., "Which mythical Greek hero demonstrated his bravery and cunning during his long journey homeward after fighting in the Trojan War?" [a] Theseus [b] Achilles [c] Odysseus or [d] Telemachus). All items were in multiple-choice format. There was no time limit on the task. The raw scores on the entire 20-item test were used in the analyses that follow.

Cultural Knowledge Checklist. The Cultural Knowledge Checklist (CKC) was a recognition measure designed to tap familiarity with some of the historical events and individuals that have formed modern society. Like the ART and MRT, this proxy measure samples a much larger domain. It is not intended to measure cultural knowledge in any absolute sense but only to reflect relative individual differences in cultural awareness. This measure was modeled directly on the recognition checklist tasks described above. Names of well-known individuals in six different categories were compiled from Hirsch (1987). The seven categories were artists, entertainers, military leaders–explorers, musicians, philosophers, scientists, and athletes. Twelve names were chosen from each of the seven categories of names. These names were then mixed with an equal number of foil names drawn from the Acknowledgment of Ad Hoc Reviewers list in the November 1987 issue of the journal *Developmental Psychology.* The names of the 24 stimuli in each category were then listed in alphabetical order and were preceded with instructions appropriate to that category. For example, the following were instructions for the artist recognition checklist:

> Below you will see a list of 24 names. Some of the people in the list are famous artists, and some are not. You are to read the names and put a check mark next to the names of those individuals who you know to be artists. Do not guess, but only check those who you know to be artists. Remember, some of the names are people who are not artists, so guessing can easily be detected.

Similar instructions preceded each of the other six checklists. The complete Cultural Knowledge Checklist thus had a total of 84 correct items and 84 foils. Foil checking was relatively rare. The mean number of foils checked per participant on the entire test was .85 (SD = 1.5). The mode was 0 (17 students), and 22 of the 27 students checked two foils or less. Scoring was analogous to the other checklist measures. The mean score on the task (proportion correct minus proportion of foils checked) was .284 (SD = .16).

Multicultural Checklist. The Multicultural Checklist was designed as a companion measure to the Cultural Knowledge Checklist. The 30 target items on this checklist were drawn from the Appendix of Multi-Cultural Literacy items compiled by Simonson and Walker (1988) to illustrate the male and European bias in Hirsch's (1987) list. The 30 target names were mixed with 15 foil names drawn from the Acknowledgment of Ad Hoc Reviewers list in the November 1987 issue of the journal *Developmental Psychology.* The names of the 45 stimuli were listed in alphabetical order and were preceded with the following instructions:

> Below you will see a list of 45 names. Some of the names in the list are those of people who are well known in various fields and some of the names are made up. You are to read the names and put a check mark next to those that you know to be the names of well-known individuals. Do not guess, but only check those who you know.

Scoring was analogous to the other checklist measures. The mean score on the task (proportion correct minus proportion of foils checked) was .312 (SD = .174).

Results

Eleventh-Grade Relationships

The exploration of the data set will begin by an examination of the contemporaneous relationships among the variables measured in the 11th grade. Table 1 presents a correlation matrix that displays the relationships among the major 11th-grade variables. The correlations below the diagonal are the zero-order correlations, and the correlations above the diagonal reflect the associations with performance on the Raven matrices partialed out. The primary measure of print exposure (ARTMRTZ) displayed moderate to strong relationships with many variables in the study. Only performance on the Raven matrices failed to correlate significantly with ARTMRTZ. Print exposure displayed a correlation of .59 with Nelson–Denny comprehension, correlations of .80 and .56 with two measures of vocabulary (Nelson–Denny and PPVT), and correlations ranging from .55 to .90 on the four measures of general knowledge (Cultural Literacy Test, History & Literature, Multicultural Checklist, and Cultural Knowledge Checklist).

The activity preference measure of reading habits converged with the primary measure of print exposure (ARTMRTZ). Choice of reading on the activity preference measure was significantly correlated with ARTMRTZ (.61), but choice of television on the activity preference measure displayed a significant negative correlation (−.42). The measures of reading comprehension, vocabulary, and general knowledge were negatively correlated with television choices and positively correlated with reading choices on the activity preference measure (although the latter positive correlations were smaller than those involving ARTMRTZ).

In several previous studies involving contemporaneous correlations (e.g., Cunningham & Stanovich, 1991; Stanovich & Cunningham, 1992, 1993; Stanovich et al., 1995), exposure to print has been demonstrated to be a significant predictor of a variety of verbal abilities, even after various indicators of general cognitive ability had been partialed out. The partial correlations displayed above the diagonal indicate that those relationships were replicated in the present data. The partial correlations between print exposure and all of the criterion variables remained significant, after performance on the Raven matrices was partialed.

Hierarchical regressions analogous to those conducted on the data from earlier studies were also conducted. In seven fixed-order, hierarchical multiple regressions, the print exposure measure was entered into the equation, subsequent to performance on the Raven matrices. The same hierarchical model was run on each of seven criterion variables: Nelson–Denny comprehension performance, the two measures of vocabulary (Nelson–Denny vocabulary and PPVT), and the four measures of general knowledge. Print exposure accounted for 23.8% of the variance in comprehension ability, after Raven performance had been partialed ($p < .01$). As in previous studies with college students (e.g., Stanovich & Cunningham, 1992), print exposure accounted for substantial unique variance in both vocabulary measures (37.0% and 15.3%, $p < .001$ and $p < .05$, respectively). Likewise, print exposure accounted for substantial proportions of unique variance in the four regressions involving the four measures of general knowledge. Although this was especially true for the two measures of general knowledge that shared response requirements with the ART and MRT (Cultural Knowledge Checklist and Multicultural Checklist, 56.0% and 51.2%, respectively), the predictive power of print exposure was not limited to them. The ARTMRTZ composite score accounted for substantial unique variance (29.6% and 26.9%, respectively) in the two measures that had very different response requirements (Cultural Literacy Test and History & Literature). In the case of each of the seven criterion variables, the beta weight for print exposure was larger than that for the measure of general ability.

Thus, print exposure was consistently a significant predictor of declarative knowledge and verbal ability, after general ability had been controlled (similar results are obtained when the PPVT is used as the general ability control in place of or in conjunction with the Raven). All of the relationships in this sample of high school students replicated those observed in college samples (e.g., Hall, Chiarello, & Edmondson, 1996; Lewellen, Gol-

Table 1
Intercorrelations of the Eleventh-Grade Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. ARTMRTZ	—	.52	−.36		.54	.72	.47	.60	.54	.91	.77
2. Activity pref-reading	.61	—	−.32		.24	.49	.29	.16	.26	.48	.39
3. Activity pref-TV	−.42	−.37	—		−.03	−.41	−.01	−.10	−.16	−.36	−.25
4. Raven	.31	.35	−.43	—							
5. ND Comprehension	.59	.32	−.06	−.42	—	.37	.36	.68	.60	.70	.62
6. ND Vocabulary	.80	.62	−.54	.52	.47	—	.29	.45	.52	.72	.63
7. PPVT	.56	.48	−.27	.54	.52	.51	—	.53	.52	.47	.24
8. Cultural Literacy Test	.67	.39	−.24	.35	.75	.55	.64	—	.72	.68	.60
9. History & Literature	.55	.39	−.24	.27	.70	.64	.60	.78	—	.67	.50
10. Cultural Knowledge List	.90	.58	−.46	.53	.72	.84	.65	.76	.70	—	.85
11. Multicultural List	.81	.45	−.34	.35	.69	.72	.39	.71	.57	.88	—

Note. Correlations below the diagonal are the zero-order correlations; correlations above the diagonal reflect the associations with performance on the Raven matrices partialed out. Correlations larger than .38 in absolute magnitude are significant at the .05 level (two-tailed). ARTMRTZ = Composite index of print exposure, Author Recognition Test and Magazine Recognition Test *z* scores; Pref = preference; Raven = Raven's Advanced Progressive Matrices; ND Comprehension = Nelson–Denny Reading Comprehension Test; ND Vocabulary = Nelson–Denny Vocabulary Test; PPVT = Peabody Picture Vocabulary Test.

dinger, Pisoni, & Greene, 1993; Stanovich & Cunningham, 1992, 1993).

First-Grade Variables and Print Exposure as Predictors of Eleventh-Grade Outcomes

The next series of analyses focuses on the ability of the retrospective print exposure measure and 1st-grade abilities to predict verbal ability and declarative knowledge in the 11th grade. The first set of analyses displayed in Table 2 presents the results of a forced entry hierarchical regression analysis in which performance on the Comprehension subtest of the Gates–MacGinitie Reading Test in the 1st grade is entered first, followed by the print exposure measure (ARTMRTZ). For example, the first criterion analyzed is 11th-grade Nelson–Denny comprehension performance. There is a substantial correlation between these two comprehension measures (.58), taken 10 years apart. Nevertheless, our measure of individual differences in print exposure in the intervening years predicted a significant proportion of additional variance in 11th-grade comprehension ability (10.2%).

Not presented are a set of parallel but completely redundant analyses with 1st-grade MAT and WRAT performance as predictors. For example, MAT scores displayed an almost identical correlation (.57) with 11th-grade Nelson–Denny comprehension performance, and print exposure accounted for 9.2% additional variance when entered as the second step after MAT performance, similar to the 10.2% in the previous analysis.

The remaining analyses indicate that 1st-grade comprehension performance was a significant predictor of six of the seven criterion variables and never displayed a correlation less than .37 with an 11th-grade variable. Indeed, correlations as high as .59 with performance on the general knowledge test were obtained. Thus, early success in reading acquisition is associated with higher verbal ability and declarative knowledge 10 years later. Nevertheless, despite the fact that early comprehension ability is moderately predictive of later verbal outcomes, when early comprehension ability is partialed out, print exposure accounted for significant additional variance in six of seven cases. The additional variance explained was quite sizable in several cases (49.8% unique variance on the Cultural Literacy Checklist and 44.8% unique variance on the Nelson–Denny Vocabulary subtest).

The next set of analyses enters 1st-grade Raven matrices performance as the first step and reveals that this measure of general cognitive ability predicts variance only in the PPVT (also sometimes interpreted as a measure of intelligence) administered 10 years later. The Raven did not correlate significantly with any of the six other measures of comprehension skill, vocabulary, and knowledge. The results from the second and third steps of the hierarchical regression illustrate that the 1st-grade Gates comprehension test and the measure of print exposure remain unique predictors of the 11th-grade criterion variables, even after Raven performance has been partialed. The third set of regressions enters 1st-grade PPVT performance as the first step and reveals that this 1st-grade measure is significantly correlated with all of the criterion variables that were administered 10 years later. When entered second, the Raven accounted for significant additional variance in only 11th-grade PPVT. However, once the two general ability measures (PPVT and Raven) had been partialed out, how fast the child acquired

Table 2
ΔR^2 for Each Step in a Hierarchical Regression Predicting a Series of Eleventh-Grade Criterion Variables

		Dependent variable						
Step	Variable	NDC	NDV	PPVT	CLT	HL	CKC	MC
				Analysis 1				
1	Grade 1, Gates C	.332**	.139†	.231**	.355**	.227*	.313**	.259**
2	ARTMRTZ	.102*	.448**	.113†	.134*	.135*	.498**	.388**
				Analysis 2				
1	Grade 1, Raven	.066	.066	.216*	.101	.000	.103	.025
2	Grade 1, Gates C	.273**	.096	.125*	.273**	.251**	.234**	.234*
3	ARTMRTZ	.095†	.425**	.078†	.120*	.164*	.474**	.402**
				Analysis 3				
1	Grade 1, PPVT	.330**	.186*	.220*	.458**	.273**	.290**	.225*
2	Grade 1, Raven	.028	.030	.159*	.049	.001	.059	.007
3	Grade 1, Gates C	.130*	.040	.055	.113*	.123*	.219*	.122*
4	ARTMRTZ	.021	.343**	.026	.023	.071†	.344**	.293**

Note. Dependent variables: NDC = Nelson–Denny Comprehension; NDV = Nelson–Denny Vocabulary; PPVT = Peabody Picture Vocabulary Test; CLT = Cultural Literacy Test; HL = History & Literature; CKC = Cultural Knowledge Checklist; MC = Multicultural Checklist; Gates C = Gates–MacGinitie Reading Comprehension subtest; ARTMRTZ = Composite index of print exposure, Author Recognition Test and Magazine Recognition Test *z* scores. Raven = Raven's Coloured Progressive Matrices.
† $p < .10$. * $p < .05$. ** $p < .01$.

reading comprehension skill as a first grader (as indicated by performance on the Gates) predicted additional variance in five of seven criterion variables. As the fourth step in the equation, exposure to print was a significant predictor in three of seven cases.

Predicting Growth in Comprehension Ability From a Retrospective Measure of Print Exposure

As mentioned in the introduction to this study, variance in performance on the recognition checklist measures of print exposure is not only presumably reflecting reading activities in the contemporaneous time period but is also indexing engagement in literacy activities from several years before. It is this characteristic that led to the characterization of the measure as a retrospective indicator of reading experiences occurring some time before the measure was administered. However, the actual retrospective reach of the instrument is unknown. In the next series of analyses, we examined whether our indicator of print exposure in the 11th grade could predict the growth of reading comprehension ability at earlier points in time.

Table 3 presents the results of several such analyses. The first forced entry regression analysis illustrates the basic logic. First-grade performance on the MAT is entered first as a predictor of 3rd-grade performance on the MAT and accounts for 49.5% of the variance. ARTMRTZ is entered as the second step in the equation to find out whether print exposure, as assessed by these instruments in the 11th grade, can predict individual differences in growth in reading comprehension ability between 1st and 3rd grade. In this case, the answer is in the affirmative, as ARTMRTZ accounted for 9.7% ($p < .05$) of the variance in 3rd-grade reading comprehension, after 1st-grade comprehension ability had been partialed out. Thus, this analysis suggests that an indicator of print exposure can track the generation of individual differences in comprehension during a period 7 to 8 years earlier.

Table 3
Composite Index of Print Exposure (ARTMRTZ) as a Predictor of Reading Comprehension Growth at Earlier Points in Time

Step	Variable	R	ΔR^2	ΔF	Final β	Final F
	Criterion variable: Grade 3 Metro %					
1	Grade 1 Metro	.704	.495	20.58**	.445	6.03*
2	ARTMRTZ	.770	.097	5.01*	.405	5.01*
	Criterion variable: Grade 5 Metro %					
1	Grade 1 Metro	.531	.282	8.64**	.193	0.93*
2	ARTMRTZ	.679	.178	7.27*	.541	7.27*
	Criterion variable: Grade 5 Metro %					
1	Grade 3 Metro	.689	.475	19.01**	.444	4.74**
2	ARTMRTZ	.735	.066	3.02	.355	3.02
	Criterion variable: Grade 10 Metro %					
1	Grade 5 Metro	.640	.410	13.90**	.325	2.82
2	ARTMRTZ	.734	.128	6.12*	.478	6.12*

Note. Metro = Reading Survey test of the Metropolitan Achievement Test; ARTMRTZ = composite index of print exposure; Author Recognition Test and Magazine Recognition Test z scores.
* $p < .05$. ** $p < .01$.

The next regression equation indicates that the same was true when reading comprehension growth was measured from 1st to 5th grade. Individual differences in ARTMRTZ accounted for 17.8% ($p < .025$) of the variance in growth in comprehension ability from 1st to 5th grade. The next regression indicates that ARTMRTZ was not a significant predictor of changes in individual differences in comprehension between 3rd and 5th grade (6.6% variance explained, $.05 < p < .10$). However, the last analysis indicates that ARTMRTZ was a significant predictor of changes in individual differences in comprehension between 5th and 10th grade (12.8% variance explained, $p < .05$). Collectively, these analyses suggest that an indicator of exposure to print administered in the high school years can predict the amount of growth in reading comprehension skill during the elementary school years and beyond.

Does Rapid Acquisition of Reading Skill in the Early Elementary Years Predict Proclivity Toward Reading in Adolescence?

So far, the analyses conducted have treated exposure to print as a predictor variable of criterion abilities, such as reading comprehension. However, it is generally agreed that comprehension ability and exposure to print are in a reciprocal relationship (Anderson, Wilson, & Fielding, 1988; Stanovich, 1986, 1993). Thus, it is equally important to ask the question: What cognitive variables predict the reading habits of adolescents?

We will focus here on an even more specific question: Aside from children's current level of reading comprehension ability, does the speed with which they attain reading fluency in their early years predict how engaged with print they will be as adolescents and adults? The regressions displayed in Table 4 provide data on this issue. Entered first in the hierarchical regression is 11th-grade reading comprehension ability (Nelson–Denny performance) to remove the direct association between print exposure and contemporaneous reading ability. Listed next in the table are alternative second steps in the regression equation. All three measures of 1st-grade reading ability (MAT, Gates, and WRAT) predicted significant variance (slightly over 10%) in 11th-grade print exposure, even after 11th-grade reading comprehension ability had been partialed out!

Table 4 indicates that the two measures of cognitive ability administered in 1st grade (Raven and PPVT) did not account for unique variance in print exposure once 11th-grade reading comprehension ability had been partialed out (and neither did the 11th-grade administration of these tasks). Thus, an early start in reading is important in predicting a lifetime of literacy experience—and this is true regardless of the level of reading comprehension ability that the individual eventually attains. Finally, 3rd- and 5th-grade measures of reading ability, being even closer in time to the criterion variable, accounted for even more variance in print exposure than did the 1st-grade measures.[1]

[1] A converging analysis was conducted across all of the assessment periods by constructing individual growth curves for the MAT standard (Rasch-scaled) scores for the 1st-, 3rd-, 5th-, and 10th-grade testing periods. There was a significant association between growth rates (slopes) and ARTMRTZ scores ($r = .78$, $p < .05$).

Table 4
Hierarchical Regression Analysis Predicting Exposure to Print in the 11th Grade

Step	Variable	R	ΔR^2	ΔF	Partial r
		Forced entry			
1	Grade 11 ND Comp	.604	.364	13.74**	
2	Grade 1 Metro	.696	.121	5.61*	.435
2	Grade 1 Gates	.681	.100	4.45*	.396
2	Grade 1 WRAT	.686	.106	4.78*	.408
2	Grade 1 Raven	.632	.035	1.39	.234
2	Grade 1 PPVT	.641	.047	1.89	.270
2	Grade 3 Metro	.765	.221	11.09**	.588
2	Grade 5 Metro	.719	.153	6.72*	.484
2	Grade 11 Raven	.621	.022	0.40	.131
2	Grade 11 PPVT	.672	.088	3.82†	.371

Note. ND Comp = Nelson–Denny Reading Comprehension Test; Metro = Reading Survey subtest of the Metropolitan Achievement Test; Gates = Gates–MacGinitie Reading Comprehension subtest; WRAT = Wide Range Achievement Test administered in Grade 1; Grade 1 Raven = Raven's Coloured Progressive Matrices; PPVT = Peabody Picture Vocabulary Test; Grade 11 Raven = Raven's Advanced Progressive Matrices.
† $p < .10$. * $p < .05$. ** $p < .01$.

Discussion

Several interesting linkages between the 1st-grade reading–cognitive measures and the 11th-grade outcomes were demonstrated in this study. First, the speed of initial reading acquisition, as operationalized by early test performance on the Gates (or MAT or WRAT—both of which produced highly convergent results) is at least moderately related to reading comprehension, vocabulary, and general knowledge in Grade 11 (see Table 2). As indicated in Table 2, early reading ability largely maintains its ability to predict these 11th-grade cognitive outcomes, even when the variance accounted for by two 1st-grade measures of general cognitive ability (Raven and PPVT) is partialed out.

When exposure to print is considered as a criterion variable (see Table 4), early reading acquisition in the 1st grade (as measured by either the Gates, MAT, or WRAT) can predict variance, even after 11th-grade comprehension ability is partialed out. This is a strong finding because it indicates that, regardless of the student's level of reading comprehension in the 11th grade, if the student got off to a fast start in reading (as indicated by their 1st-grade reading ability score), then they are more likely to engage in more reading activity. Thus, a fast initial start at reading acquisition might well help to develop the lifetime habit of reading, irrespective of the ultimate level of reading comprehension ability that the individual attains.

It should also be noted that, as predictors of 11th-grade print exposure, both 3rd and 5th-grade reading ability were more potent than was 1st-grade reading. Although such stronger associations might be expected because they are closer in time to the criterion variable, there is a substantive interpretation that might also be made. Children who lag in reading in 1st grade but catch up by 3rd or 5th grade have a good prognosis for their level of future reading engagement.

In several analyses of the results of this study (see Table 3), the print exposure measures administered in the 11th grade were interpreted as cumulative indicators of individual differences in reading habits that had been exercised for several years prior to the administration of the print exposure measures. The analyses displayed in Table 3 illustrate that, on such an interpretation, individual differences in exposure to print can predict differences in the growth in reading comprehension ability throughout the elementary grades and thereafter.

Despite many striking findings, our study had several limitations. For example, our primary measures of print exposure—the magazine and author recognition checklists (MRT and ART)—are clearly very indirect measures of amount of reading experience. Clearly, hearing about a magazine or author on television without having been exposed to the actual written work is problematic. The occurrence of this type of situation obviously reduces the validity of the tasks, and we have been concerned about such issues of construct validity (Allen, Cipielewski, & Stanovich, 1992; Stanovich & West, 1989; West et al., 1993). In this context, it is troublesome that the correlations between the MRT and the ART and the Cultural Knowledge Checklist (.75 and .93) and the Multicultural Checklist (.72 and .79) were virtually as high as that between the ART and MRT themselves (.77). Of course, the former correlations are no doubt high because of shared method variance. (The correlations with general knowledge measures that were not in checklist format were lower.) Nevertheless, there is a concern that these four measures may be tapping some general ability to absorb knowledge rather than print exposure and declarative knowledge, respectively.

There are two classes of evidence, though, that argue against such an interpretation. First, the activity preference questionnaire responses favoring reading did show the same pattern of relationships as did the ART and MRT, although the relationships were always weaker and not always statistically significant. This is consistent with research in which measures of print exposure other than the checklists (diaries, questionnaires, activity preference measures) have converged with the recognition checklists and have displayed the same relationships with other variables (Allen et al., 1992; Stanovich & Cunningham, 1992; Stanovich & West, 1989). Second, in other research, controls were occasionally included for the information absorption hypothesis. Specifically, we have sometimes entered another recognition checklist (usually a television name recognition measure) prior to print exposure in a hierarchical regression analysis to control for method variance and the general ability to retain information (see Echols et al., 1996; Stanovich & Cunningham, 1993; West & Stanovich, 1991). We have consistently found that the print exposure measures predicted unique variance when such controls were invoked.

Obviously, any theoretical or practical implications drawn from these data must be highly tentative because the attrition in our sample over the 10-year period resulted in a small sample size for the final investigation and, of course, our study was correlational. However, with this and the previous caveats clearly in mind, we would attempt the following extrapolation. Combining the implications of the outcomes illustrated in Tables 3 and 4, it is possible to sketch a view of the reciprocal influences of print exposure and early reading acquisition (for which research is converging on an increasingly explicit model, see Adams, 1990; Share, 1995; Share & Stanovich, 1995) as determinants

of later reading comprehension (and other cognitive outcomes). Early success at reading acquisition is one of the keys that unlocks a lifetime of reading habits. The subsequent exercise of this habit serves to further develop reading comprehension ability in an interlocking positive feedback logic (Juel, 1988; Juel, Griffith, & Gough, 1986; Snow, Barnes, Chandler, Goodman, & Hemphill, 1991; Stanovich, 1986, 1993). The present longitudinal analyses have provided a window on the past literacy experiences of this first-grade sample and some empirical clues to the cause of their subsequent divergences in verbal abilities and general knowledge.

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Appendix A

Percentage Recognition of Authors on the Author Recognition Test (N = 27)

Author	Overall *M*	Author	Overall *M*
Isaac Asimov	44.4	John Jakes	3.7
Dave Barry	11.1	Stephen King	100.0
Judy Blume	85.2	Dean Koontz	25.9
Erma Bombeck	40.7	Judith Krantz	25.9
Barbara Cartland	0.0	Louis L'Amour	18.5
Carlos Castaneda	0.0	Ursula LeGuin	3.7
Tom Clancy	22.2	C.S. Lewis	44.4
Arthur C. Clarke	14.8	Hal Lindsay	3.7
James Clavell	7.4	Robert Ludlum	14.8
Jackie Collins	63.5	James Michener	7.4
Stephen Coonts	0.0	Toni Morrison	0.0
Ian Fleming	25.9	M. Scott Peck	3.7
Robert Fulgham	11.1	Sidney Sheldon	63.5
Stephen J. Gould	3.7	Danielle Steel	66.7
Andrew Greeley	0.0	Alvin Toffler	0.0
Bette Greene	3.7	J.R.R. Tolkien	25.9
Alex Haley	11.1	Alice Walker	11.1
Frank Herbert	11.1	Irving Wallace	7.4
Robert Heinlein	3.7	Joseph Wambaugh	0.0
Tony Hillerman	3.7	Bob Woodward	7.4
S.E. Hinton	11.1	Paul Zindel	11.1

Appendix B

Percentage Recognition of Magazines on the Magazine Recognition Test (N = 27)

Magazine	Overall *M*	Magazine	Overall *M*
Analog Science Fiction	7.4	*Mademoiselle*	74.1
Atlantic	0.0	*McCall's Magazine*	55.6
Better Homes & Gardens	96.3	*Modern Bride*	63.5
Black Beat	11.1	*Motor Trend*	81.5
Business Week	74.1	*National Geographic*	96.3
Byte	11.1	*National Inquirer*	77.8
Car and Driver	81.5	*New Yorker*	48.1
Circus	22.2	*Newsweek*	89.9
Consumer Reports	85.2	*Omni*	51.9
Cosmopolitan	93.6	*Outdoor Life*	55.6
Creem	25.9	*People*	85.2
Discover	77.8	*Popular Electronics*	11.1
Ebony	70.4	*Popular Science*	51.9
Esquire	51.9	*Premiere*	14.8
Essence	44.4	*Psychology Today*	22.2
Family Circle	77.8	*Reader's Digest*	100.0
Field & Stream	63.5	*Redbook*	81.5
Forbes	40.7	*Road & Track*	33.3
Gentlemen's Quarterly	48.1	*Rolling Stone*	89.9
Glamour	77.8	*Sassy*	51.9
Good Housekeeping	74.1	*Scientific American*	14.8
Guitar Player	22.2	*Self*	22.2
Harper's Magazine	14.8	*Seventeen*	89.9
Hot Rod	70.4	*Smithsonian*	40.7
House & Garden	25.9	*Spin*	51.9
Inside Sports	25.9	*The Sporting News*	37.0
Jet	33.3	*Thrasher*	37.0
Ladies Home Journal	29.6	*Time*	93.6
Life	66.7	*Town & Country*	25.9
		TV Guide	93.6
		US News & World Report	55.6
		Vogue	81.5

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