Research Articles

MEASURING READING BEHAVIOR: EXAMINING THE PREDICTIVE VALIDITY OF PRINT-EXPOSURE CHECKLISTS

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ABSTRACT

Print-exposure checklists offer an indirect index of reading behavior. The present study examined whether performance on a print-exposure checklist could predict reading-related behavior in the form of online shopping intentions. A total of 232 participants completed a print-exposure checklist and an online shopping task, creating a "wishlist" of desired items. Individuals who wished to purchase fiction books scored higher on fiction print-exposure than those who did not. There was little difference in nonfiction print-exposure between those who wished to purchase nonfiction books and those who did not. This study provides some evidence for the validity of genre-specific checklist measures of print-exposure by demonstrating an association with shopping intentions, but more work is needed to further explore the lack of association observed for nonfiction print-exposure.

Reading for pleasure has long been associated with educational benefits and personal development (Mol & Bus, 2011). Unfortunately, the study of leisure reading is made difficult by measurement issues, such as the problem of socially-desirable responding for self-report measures. To overcome these problems, Stanovich and West (1989) developed the Author Recognition Test (ART). The ART is a checklist measure that utilizes a signal-detection logic to measure

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exposure to print, an indirect index of reading behavior. Previous research has validated the ART and other print-exposure checklists by examining the cognitive correlates of reading (for a review and meta-analysis, see Mol & Bus, 2011). However, there is little behavioral evidence that directly relates performance on print-exposure checklists to real-world reading-related behavior. The present study examined whether a revised version of the ART could predict reading-related behavior in the form of online shopping intentions.

MEASURING READING BEHAVIOR

Traditionally, reading behavior has been assessed using interviews and self-report questionnaires. However, because reading is often equated with intelligence, self-report approaches to assessing reading are especially susceptible to biases associated with socially-desirable responding. In other words, because reading is such a culturally-valued practice, respondents may inflate their reports of reading frequency in order to create a favorable impression (West, Stanovich, & Mitchell, 1993).

An alternative approach to measuring reading behavior is the daily diary method, in which participants are asked to record the amount of time they spend reading each day. Although this method is more reliable than interviews and questionnaires, it has several disadvantages. For one, it does not circumvent the problem of socially-desirable responses (West et al., 1993). Additionally, this task requires retrospective estimation of reading activities, a cognitively demanding task that may yield inaccurate reports (Bradburn, Rips, & Shevell, 1987). Lastly, the daily diary method is time-consuming and requires a great level of commitment on the part of participants, as well as being relatively resource-intensive for researchers. For all of these reasons, the use of this approach is unfeasible in many research contexts (West et al., 1993).

MEASURING PRINT-EXPOSURE

ART (Stanovich & West, 1989) was developed to overcome the problems of self-report reading measures. It relies on familiarity with the names of authors as an index of exposure to print, with print-exposure acting as a proxy for reading behavior and preferences. The ART consists of a list of names of authors (target items) and non-authors (foils). Participants are instructed to select those names that they identify as authors, with guessing or indiscriminate checking discouraged by the explicit warning that some names on the list are not those of authors (i.e., foils), making these behaviors easily detectable. The assumption is that people who read more frequently are also more likely to be interested in literature and to engage in reading-related activities, such as going to bookstores and libraries and participating in book clubs. In this way, they learn about various authors (Stanovich & West, 1989). Thus, people who read more frequently are

expected to correctly recognize more author names on the ART than those who read less frequently.

The ART can be easily modified to measure different types of reading behaviors in various populations. For example, the Magazine Recognition Test (MRT) (Stanovich & West, 1989) and Comics Recognition Test (CRT) (Allen, Cipielewski & Stanovich, 1992) were designed to tap into exposure to magazines and comics books, respectively. The Title Recognition Test (TRT) (Cunningham & Stanovich, 1991), as well as child versions of the ART (e.g., Cipielewski & Stanovich, 1992; Sénéchal & LeFevre, 2002; Sénéchal, LeFevre, Hudson, & Lawson, 1996; Sénéchal, LeFevre, Thomas, & Daley, 1998; Spear-Swerling, Brucker, & Alfano, 2010), have all been used to assess reading behavior in children.

VALIDITY OF PRINT-EXPOSURE CHECKLISTS

Because print-exposure checklists do not assess reading behavior directly, it is important to examine their ability to predict actual real-world reading. Most of the existing evidence regarding the validity of these checklists comes from studies that focus on the cognitive correlates of reading, such as reading comprehension and vocabulary (Anderson, Wilson & Fielding, 1988; Echols, West, Stanovich & Zehr, 1996). A meta-analysis based on 99 studies ($N = 7,669$) that employed print-exposure checklists found that print-exposure predicts reading comprehension, spelling, and reading and oral language skills (Mol & Bus, 2011). This is consistent with the idea that these checklist measures are related to actual reading. Additional studies have found that ART scores are predicted by early reading ability (Cunningham & Stanovich, 1997) and knowledge acquisition (Stanovich & Cunningham, 1993), even after controlling for cognitive ability. In addition, past research has found that checklist measures exhibit better predictive validity with respect to reading and vocabulary than self-report measures (Sénéchal et al., 1996), and equivalent validity to daily diary approaches (Allen et al., 1992).

Behavioral validation of these measures, however, is scarce, with few studies to date presenting such evidence. One study found that parents recognized more authors on a child version of the ART than did non-parents (Sénéchal et al., 1996). Along similar lines, primary school teachers scored higher on a child version of the ART than did secondary school teachers (Stainthrop, 1997). These studies demonstrate that populations who should have greater exposure to certain genres of writing do indeed demonstrate greater performance on associated checklist measures. Only one study to date has demonstrated a direct relationship between performance on a print-exposure checklist and actual reading behavior. In this study, individuals who were observed to be reading at an airport waiting lounge scored higher on the ART than those who were not reading (West et al.,

1993). It is clear that further research is needed to demonstrate that print-exposure checklists do indeed measure real-world reading-related behaviors.

VALIDITY OF GENRE-SPECIFIC PRINT-EXPOSURE CHECKLISTS

Validity evidence for genre-specific print-exposure checklists is especially scarce, despite a growing body of work showing that fiction and nonfiction print-exposure are associated with different social and cognitive outcomes (Fong & Mar, 2011). For example, lifetime exposure to fiction, but not to nonfiction, is related to greater interpersonal sensitivity (Fong & Mar, 2011; Fong, Mullin, & Mar, 2013; Mar, Oatley, Hirsh, dela Paz, & Peterson, 2006), and this relationship holds even after controlling for individual differences such as gender and personality traits (Mar, Oatley, & Peterson, 2009). Moreover, vocabulary skills have been shown to be more strongly associated with fiction print-exposure than with nonfiction print-exposure (Osana, Lacroix, Tucker, Idan, & Jabbour, 2007). Given that fiction and nonfiction reading tend to be highly correlated (e.g., Mar et al., 2006), it is important to develop measures that can reliably capture genre-specific reading behavior in order to better understand the unique effects of exposure to fiction versus nonfiction.

The present study attempts to provide additional support for the predictive validity of print-exposure checklists. In addition, it is the first validation study of a print-exposure checklist assessing exposure to two distinct genres. In our study, the validity of a revised version of the ART was evaluated by exploring whether this print-exposure checklist could predict reading-related behaviors. Specifically, we examined whether performance on this measure could predict a preference for purchasing books by assessing online shopping intentions.

METHOD

Participants

Participants were 232 university undergraduates (154 females), ranging in age from 17 to 32 years, $M = 19.63$, $SD = 2.22$.

Measures

Print Exposure

The Author Recognition Test-Revised (ART-R) (Mar et al., 2006) was used to assess lifetime print-exposure to two distinct genres: narrative fiction and expository nonfiction. Each genre was further broken down into five sub-genres to ensure breadth, with each sub-genre including 10 names. The final measure

included 50 names of narrative fiction authors, 50 names of expository nonfiction authors, and 40 foils. Only names of authors who worked exclusively in either the fiction or nonfiction domains were included (see Mar et al., 2006, for details).

Reading Habits

A six-item questionnaire was used to measure participants' self-reported reading habits (Table 1). Participants rated their liking for fiction and non-fiction, as well as their preference for fiction over nonfiction (and vice versa), on a 7-point scale ranging from *Strongly Disagree* to *Strongly Agree*. Frequency of reading fiction and nonfiction was also assessed, using a 9-point scale with the anchors *Never* (1), *Occasionally* (3), *Roughly Once a Month* (5), *Roughly Once a Week* (7), and *Roughly Every Day* (9).

Purchasing Preferences

Participants completed an online shopping task on Amazon.ca in which they were asked to generate a "wishlist": a list of items they would purchase if given $50 to spend on the site. They were free to choose any number of items from the site, as long as the combined total did not exceed $50. Amazon.ca sells a wide variety of items not limited to media products (i.e., books, CDs, DVDs, etc.), but also including housewares and electronics. This site therefore provided a good forum for assessing the diversity of people's real-life shopping preferences.

Procedure

Participants completed an online survey that began with an informed consent form. After indicating consent, the participants completed all questionnaires online. These questionnaires were completed within the context of other measures not germane to the current study that assessed television watching

Table 1. Reading Habits Questionnaire

Items
1. I like to read fiction (novels, etc.).
2. I read fiction (novels, short stories, etc.).
3. I like to read nonfiction (biographies, etc.).
4. I read nonfiction (business, philosophy, etc.).
5. I prefer to read fiction (novels, etc.) over nonfiction (biographies, etc.).
6. I prefer to read nonfiction (biographies, etc.) over fiction (novels, etc.).

habits, personality, empathy, loneliness, and attachment styles. The shopping preference task was always completed last, while the order of the preceding eight questionnaires, which included the ART-R, was randomized. As a result, the interval of time between completing the two measures of interest for this study varied randomly. When participants reached the purchasing preferences task, they received the following instructions: "For the next task you will be asked to go to the Amazon.ca website. You will be asked to spend up to but not more than $50 on any new items of your choice (books, CDs, DVDs, furnishings, electronics, etc.)." Detailed technical instructions were then provided to help participants create and save a "wishlist."

RESULTS

Fiction and nonfiction print-exposure scores were calculated using a signal-detection logic, with foils (non-author names checked) subtracted from targets (actual authors recognized), thus correcting for guessing or indiscriminate responding. Prior to foil-subtraction, ART-Fiction scores ranged from 0 to 27 ($M = 5.22$, $SD = 5.54$) and ART-Nonfiction scores ranged from 0 to 26, $M = 4.59$, $SD = 4.91$. Internal reliability for the ART-R was calculated using Cronbach's alpha, based on the target items for fiction and nonfiction prior to subtracting foil scores; these internal reliabilities were acceptable, ART-Fiction: Cronbach's $\alpha = .87$; ART-Nonfiction: $\alpha = .86$. Following foil-subtraction, the correlation between the ART-Fiction and the ART-Nonfiction based on Spearman's rho was .50, $p < .001$. Self-report fiction and nonfiction reading habits scores ranged from 1 to 7.67 ($M = 4.77$, $SD = 1.64$; $M = 3.63$, $SD = 1.62$, respectively).

Each participant's "wishlist" was coded and the items selected were grouped into categories according to media type and genre, using the Amazon.ca categorization scheme as a guide (Table 2). The categories of interest for this study were Fiction Books and Nonfiction Books. Due to limited variability in the number of items that were selected in each of these categories (i.e., most chose 0 or 1, with few choosing more than 1 item), dichotomous scoring was used to represent purchasing intent. For each category, participants were assigned a "1" if they purchased any items that belong to that category and a "0" if they did not. In order to accommodate for price fluctuations between the time of "wishlist" generation and the time of "wishlist" retrieval for coding, the maximum allowable total amount per list was set at $60. Consequently, data from 33 additional participants were excluded from the analyses due to exceeding the allowable spending amount ($N = 29$) or to having an item on their list that was no longer available at the time of coding ($N = 4$), the latter making it impossible to identify the item's price or the category to which it belonged.

Table 2. Descriptive Statistics for Shopping Intentions

Category	Frequency	Mean	SD	Min.	Max.
Fiction books	82.00	.66	1.11	0.00	5.00
Nonfiction books	56.00	.39	.79	0.00	3.00
Both fiction and nonfiction books	29.00	.25	.68	0.00	3.00
Fiction DVDs	76.00	.43	.69	0.00	3.00
Nonfiction DVDs	12.00	.05	.22	0.00	1.00
Electronics	29.00	.16	.53	0.00	5.00
Home and garden	17.00	.09	.36	0.00	3.00
Computers and video games	27.00	.12	.34	0.00	2.00
Music	63.00	.42	.80	0.00	4.00
Sporting goods	12.00	.07	.35	0.00	3.00
Total number of items selected		2.41	1.06	1.00	6.00
Price of selected items		46.30	8.00	14.99	59.34

Fiction Print-Exposure and Shopping Behavior

We first explored whether there were any print-exposure differences between those who included fiction books in their "wishlist" and those who did not. We expected that individuals who wished to purchase fiction books would be interested in literary fiction and therefore exhibit greater lifetime print-exposure to fiction texts than those who did not wish to purchase items from this category. Specifically, those who selected at least one fiction book were expected to score higher on the Fiction sub-scale of the ART-R than those who did not. Scores for the ART-R were not normally distributed, so the Mann-Whitney U, a nonparametric statistic, was used to test this hypothesis.

Consistent with our expectation, individuals who purchased fiction books scored higher on fiction print-exposure than those who did not purchase fiction books ($U = 4730.50$, $p < .01$, $r = .19$). On the other hand, there were no differences in nonfiction print-exposure between participants who purchased fiction items and those who did not ($U = 5682.00$, $p = .33$, $r = .06$).

A logistic regression was carried out to rule out the possibility that the relationship between intent to purchase fiction books and exposure to narrative fiction is a function of participant demographics (Table 3). Age and gender, the control variables, were entered into the first block, and participants' scores on the Fiction sub-scale of the ART-R were entered into the second block. Age and gender predicted intent to purchase fiction books, with older females more likely to have these items in their "wishlists." Fiction print-exposure was also a unique predictor of desire to buy literary fiction, even after accounting for age and gender effects.

Nonfiction Print-Exposure and Shopping Behavior

The results of the previous analysis show that ART scores of narrative fiction print-exposure correspond to a preference for purchasing fiction books, but does a similar pattern exist with regard to nonfiction print? We expected that individuals who selected nonfiction books for their "wishlists" would score higher on the Nonfiction sub-scale of the ART-R than those who did not. Based on a Mann-Whitney U test, however, there were no statistically significant differences in nonfiction print-exposure between those who purchased nonfiction books and those who did not ($U = 4538.50$, $p = .37$, $r = .06$). There were also no differences in fiction print-exposure between participants who intended to purchase nonfiction books and those who did not ($U = 4874.50$, $p = .90$, $r = .00$).

Print-Exposure Checklists vs. Reading Habits Self-Report

Two additional logistic regression analyses were conducted in order to compare the predictive validity of the ART-R to that of self-reported accounts of reading habits. Past research has shown that checklist measures exhibit better predictive validity than self-report measures with respect to reading and vocabulary (Allen et al., 1992; Sénéchal et al., 1996), so we expected to replicate these results in the present study using shopping intentions as the criterion variable. In the first analysis, intent to purchase fiction books was the dependent variable, age and gender were entered into the first block, Fiction ART-R scores were entered into the second block, and self-report reading habits were entered into the third block (Table 4). Consistent with the previous analysis, age and gender predicted intent to purchase fiction books. Surprisingly, participants' self-reported fiction preference scores predicted the intent to buy fiction books over and above their Fiction ART-R scores. A similar pattern emerged in the second analysis, in

Table 3. Logistic Regression Showing Prediction of Intent to Buy Fiction Books by Age, Gender, and Fiction Print-Exposure

Intention to buy fiction	Variable	B	SE	95% CI for odds ratio		
				Lower	Odds ratio	Upper
Model 1 $R^2 = .12$ (Cox & Snell), .17 (Nagelkerke) $\chi^2 = 30.70^*$	Age	.15*	.07	1.02	1.17	1.33
	Gender	1.76*	.37	2.80	5.81	12.08
	Constant	−6.65*	1.62		.00	
Model 2 $R^2 = .12$ (Cox & Snell), .20 (Nagelkerke) $\chi^2 = 35.98^*$	Age	.14*	.07	1.00	1.15	1.33
	Gender	1.66*	.38	2.52	5.27	11.01
	Fiction Print-Exposure	.09*	.04	1.01	1.10	1.19
	Constant	−6.56*	1.66		.00	

$^*p < .05$.

Table 4. Logistic Regression Showing Prediction of Intent to Buy Fiction Books by Age, Gender, and Fiction Print-Exposure, and Self-Report Fiction Reading Habits

Intention to buy fiction	Variable	B	SE	95% CI for odds ratio		
				Lower	Odds ratio	Upper
Model 1 R^2 = .12 (Cox & Snell), .17 (Nagelkerke) χ^2 = 30.70*	Age	.15*	.07	1.02	1.17	1.33
	Gender	1.76*	.37	2.80	5.81	12.08
	Constant	−6.65*	1.62		.00	
Model 2 R^2 = .14 (Cox & Snell), .20 (Nagelkerke) χ^2 = 35.98*	Age	.14*	.07	1.00	1.15	1.33
	Gender	1.66*	.38	2.52	5.27	11.01
	Fiction Print-Exposure	.09*	.04	1.01	1.10	1.19
	Constant	−6.56*	1.66		.00	
Model 3 R^2 = .23 (Cox & Snell), .32 (Nagelkerke) χ^2 = 60.32*	Age	.22*	.08	1.06	1.24	1.45
	Gender	1.44*	.40	1.95	4.24	9.20
	Fiction Print-Exposure	.02	.05	.93	1.02	1.11
	Self-Report Fiction Reading Habits	.58*	.13	1.38	1.80	2.32
	Constant	−10.31*	2.10		.00	

*p < .05.

Table 5. Logistic Regression Showing Prediction of Intent to Buy Nonfiction Books by Age, Gender, and Nonfiction Print-Exposure, and Self-Report Nonfiction Reading Habits

Intention to buy nonfiction	Variable	B	SE	95% CI for odds ratio		
				Lower	Odds ratio	Upper
Model 1 $R^2 = .01$ (Cox & Snell), .01 (Nagelkerke) $\chi^2 = 1.60$	Age	.07	.07	.94	1.07	1.22
	Gender	–.20	.32	.44	.82	1.54
	Constant	–2.20	1.44		.11	
Model 2 $R^2 = .01$ (Cox & Snell), .01 (Nagelkerke) $\chi^2 = 2.09$	Age	.07	.07	.95	1.07	1.22
	Gender	–.18	.32	.44	.83	1.57
	Nonfiction Print-Exposure	.04	.05	.94	1.04	1.15
	Constant	–2.35	1.60		.10	
Model 3 $R^2 = .03$ (Cox & Snell), .04 (Nagelkerke) $\chi^2 = 6.15$	Age	.06	.07	.93	1.06	1.21
	Gender	–.08	.33	.48	.92	1.76
	Nonfiction Print-Exposure	.02	.05	.92	1.02	1.14
	Self-Report Nonfiction Reading Habits	.20*	.10	1.00	1.22	1.48
	Constant	–2.99*	1.51		.05	

*$p < .05$.

which the selection of nonfiction books was the dependent variable (Table 5). Age and gender were entered into the first block, and Nonfiction ART-R and self-report reading habits scores were entered into the second block. Participants' self-reported preference for nonfiction was the only statistically significant predictor of the intent to purchase nonfiction books.

DISCUSSION

The results from this study offer new behavioral evidence that links print-exposure checklists to a real-world reading-related behavior. Specifically, performance on a revised version of the ART predicted online shopping intentions, controlling for the effects of age and gender, with respect to narrative fiction books. Individuals who wished to purchase fiction books recognized more fiction authors on the ART-R than those who did not wish to purchase fiction books. It seems that individuals who are interested in narrative fiction and who seek out opportunities to read works in this genre do show greater familiarity with fiction authors, as measured by the ART-R checklist, than do individuals who have no interest in reading literary fiction. Thus, the results of this study validate the ART-R as a measure of print-exposure to narrative fiction.

However, it is unclear whether this conclusion can be extended to nonfiction print-exposure. Although individuals who wished to purchase nonfiction books recognized more nonfiction authors on the ART-R than those who did not wish to purchase nonfiction books, this difference was not statistically significant. One reason for this could be related to the authors chosen to represent the nonfiction category. Participants might have recognized authors such as Stephen Hawking and Michael Moore from popular media outlets (e.g., the news, websites) rather than from personal experience with their books. As a result, it is possible that individuals recognized these authors without having read their work or having any interest in nonfiction. This would introduce noise into the measurement of nonfiction print-exposure and obscure possible relations. An analysis of the ART-R using Item Response Theory might help shed light on this issue by examining whether the difficulty and discrimination levels of items chosen to represent fiction and nonfiction are comparable. However, this remains a topic for future research.

Another possible explanation for the null effect observed for nonfiction is that this is a unique characteristic of our sample, which was based on an undergraduate student population. Undergraduate students seem more likely than members of the general population to learn about famous philosophers and scientists, such as Noam Chomsky and Richard Dawkins, from sources other than personal reading experience. For example, many university programs have a breadth requirement, mandating that students take general education courses in order to graduate. These are often introductory courses that offer an overview of the work of well-known social, political, and physical scientists. Thus, students may

recognize names of nonfiction authors simply from learning about them in a class they had no choice in taking. Additional research using samples drawn from the general population would help to better determine the validity of the nonfiction print-exposure measure.

Another limitation of the present study is that it assessed purchasing preferences rather than actual shopping behaviors. As a result, we cannot be certain that the results of this study generalize to real-world shopping behavior. In addition, participants were not explicitly told that they should select items for themselves, so there is a chance that some items were selected as gifts for others, who might be readers. However, even if books were added to the "wishlist" as gifts, this would have introduced random noise into the analysis and reduced the probability of observing the selective relations we observed. Our results may therefore be attenuated and underestimating real effects, as well as possibly include false-negatives. The null result for nonfiction print-exposure should therefore perhaps be interpreted with some caution. Given the great variety of merchandise that participants could choose from, their freedom to choose from these items, and the diversity of choices made, these "wishlists" seem likely to represent real-life interests and shopping tendencies.

Yet another limitation in our study is the possibility that the instructions for the shopping task primed participants to purchase books, since the first example item in these instructions was books. However, it is important to note that genre was not mentioned anywhere in these instructions. Therefore, if participants were indeed primed with a motivation to purchase books, their decision to select items of a particular genre was likely spontaneous and independent of the instructions they received. It is therefore unlikely that a social desirability effect could explain the unique association between Fiction ART-R scores and the selection of narrative fiction books on the shopping task. Since all participants received the same instructions and these were not confounded in any way with the ART-R scores, the possible noise introduced into the analysis by any such priming would be random and not systematic.

It is also possible that the completion of the ART-R prior to the shopping task could have affected participants' item selections by priming them to purchase books. However, the specific direction of any such influence is unclear. For one, like the instructions for the shopping task, the ART-R instructions did not mention genre. Therefore, even if completing the ART-R primed "readers" (those scoring high on the ART-R) to think about and seek out books to a greater extent than it did for "non-readers" (those scoring low on the ART-R), their decision to purchase books of a particular genre would have depended on their personal genre preferences. It might also be the case that "non-readers" were more motivated to purchase books than "readers" in order to compensate for their poor performance on the ART-R. This differential priming for "readers" and "non-readers" does not appear to provide an adequate explanation of the genre-specific associations that we observed.

Surprisingly, our study showed that self-report reading habits were a better predictor of shopping intentions than were print-exposure scores. This is inconsistent with past research showing that checklist measures exhibit better predictive validity for vocabulary than self-report measures (Allen et al., 1992; Sénéchal et al., 1996). Social desirability might explain these contradictory findings. Whereas it is difficult to modify one's responses on a vocabulary test to boost one's image, it is easy to do so on a shopping task. Reading is often associated with intelligence and it is possible that fiction and nonfiction each has its unique set of lay associations or stereotypes (Mar et al., 2006). Since the self-report questionnaires explicitly contrasted fiction with nonfiction, and seeing as how it was completed prior to the shopping task, it is possible that it primed certain individuals to present themselves in a particular way with regard to their shopping intentions, thereby inflating associations. In contrast, since the instructions for the ART-R did not mention genre, it is less likely that the association between performance on this measure and the shopping task is the result of social desirability bias. That said, these results do speak to the importance of including multiple forms of measurement for all constructs of interest.

The present study provides some preliminary evidence for the predictive validity of a genre-specific print-exposure checklist by showing that performance on this type of measure can predict a real-world behavior that relates to reading preferences for a particular genre (i.e., narrative fiction). It thus provides further support for the use of checklist measures in reading research. However, further research is needed to examine whether performance on print-exposure checklists (both general and genre-specific) predicts actual reading behavior.

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